Notebook Series -- Notebooks by Experimenters Other Than Edison
Navy and Wartime Research Experiments -- J. A. Hanley Books
Notebook, N-18-05-12

This notebook was used by John A. Hanley during May 1918-February 1919 for experimental notes on submarine detection. The entries deal primarily with the deployment, placement, rigging, and sensitivity of the detector. Also included are tests of listening devices for submarine torpedoes and experiments involving the "quick turning of ships." Some of the experiments were conducted aboard the USS *Sachem* and the harbor steamer *Clio*. The notes indicate that Hanley was reporting directly to Edison and that William A. Hayes was conducting related experiments during the same time. The front cover is labeled "Experiments. Edison Submarine Detector. No - 1. From, May 12-18, To, Feb 14-19 J. Hanley." The pages are unnumbered. Approximately 135 pages have been used.

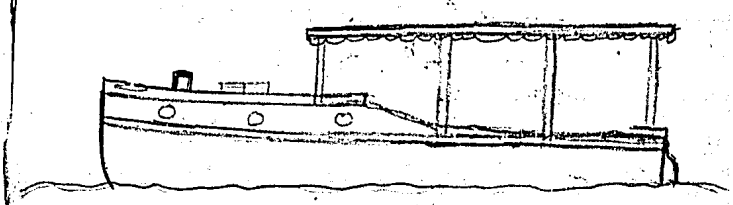
J. A. Hanley.
Edison Lab.
West Orange
N. J.

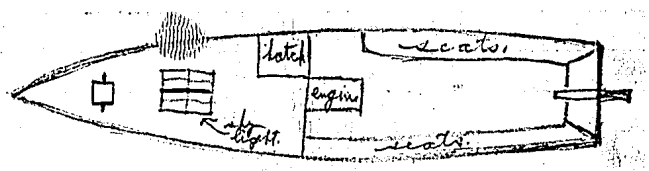
75428

Acme Co.,
MFG. STATIONERS,
96 JOHN ST.
AND
19 PLATT ST.
NEW YORK.

May 12. 1918.

After doing some preliminary experiments at Lab. I decided to hire a launch so we could make some accurate determinations before going on large boat (Sachem)





May 13. 1918. 1

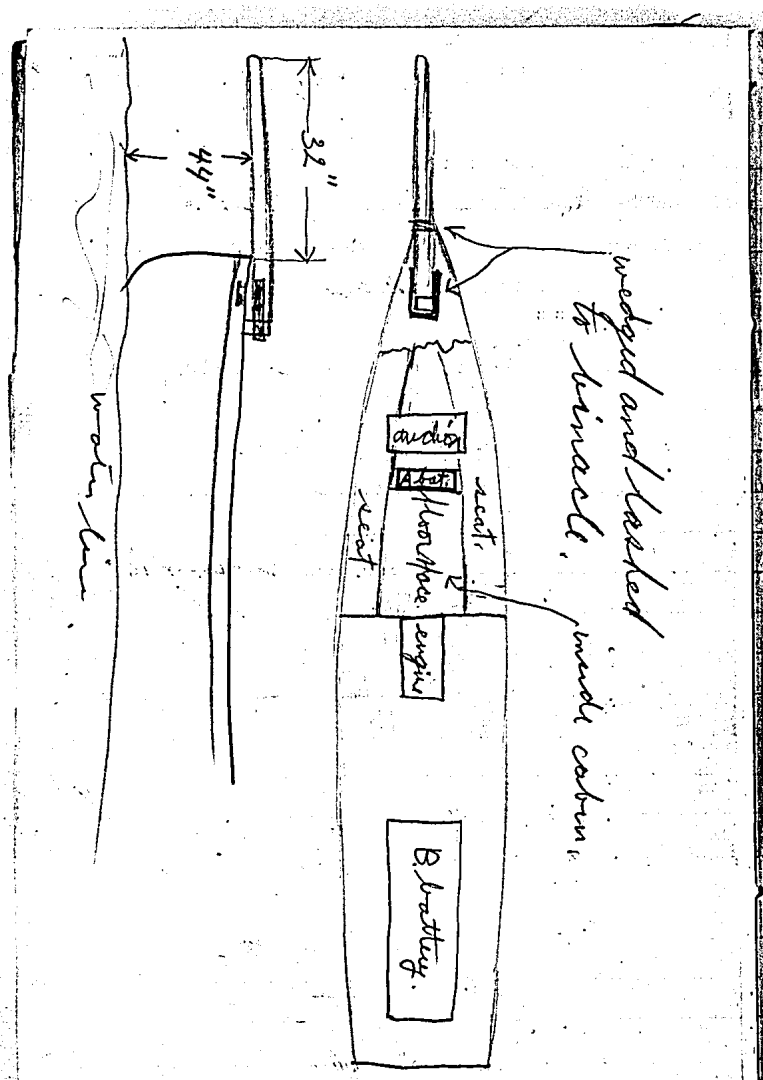
Description of motor launch "Majestic."

26 ft. cabin boat.
draught 24"
beam 6'
2 cylinder 12 H.P.
Lathrop engine located amid-ships.

speed about 9 miles per hour. (statute miles)

cabin extends from bow to amid-ships

canopy over stern from amid-ships.



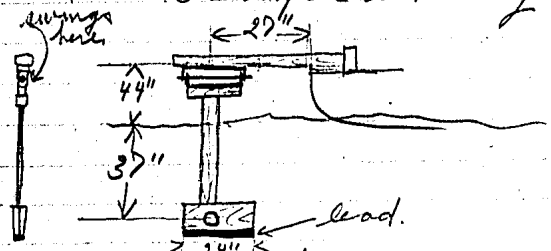
May. 14. 1918. 2

Set up 3 stage audion on motor launch and constructed bowsprit as shown in sketch on opposite page.

Audion was very quiet.

Rigged apparatus containing transmitter from bowsprit as shown.

It is free to swing to port

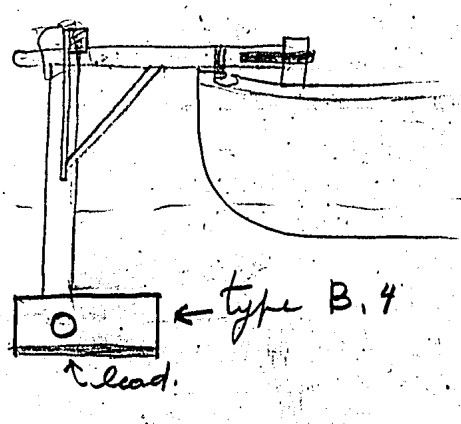


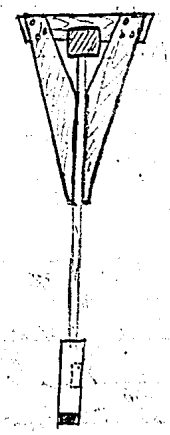
or starboard.

Found that it wanted to raise to the surface due to the action of the tide which was flowing at the rate of ½ knot per hour.

Added more lead to bottom. (about 7 lbs.)

Results the same.





May. 15. 1918. 3

Run launch at slow speed model raised to the surface of the water.

When stopped it would come back to the vertical position.

Found that by holding in a vertical position with a stick on each side there was very little tendency to raise, but if it got a few degrees start it was very difficult to hold it.

Constructed braces to hold model in a fixed position as shown on opposite page.

While laying at dock tested instruments.

Res of transmitter 72 ω
" " ground 10000000 ω
audion very quiet.
apparatus also very quiet
heard tug over one mile down the river.

Run launch out at

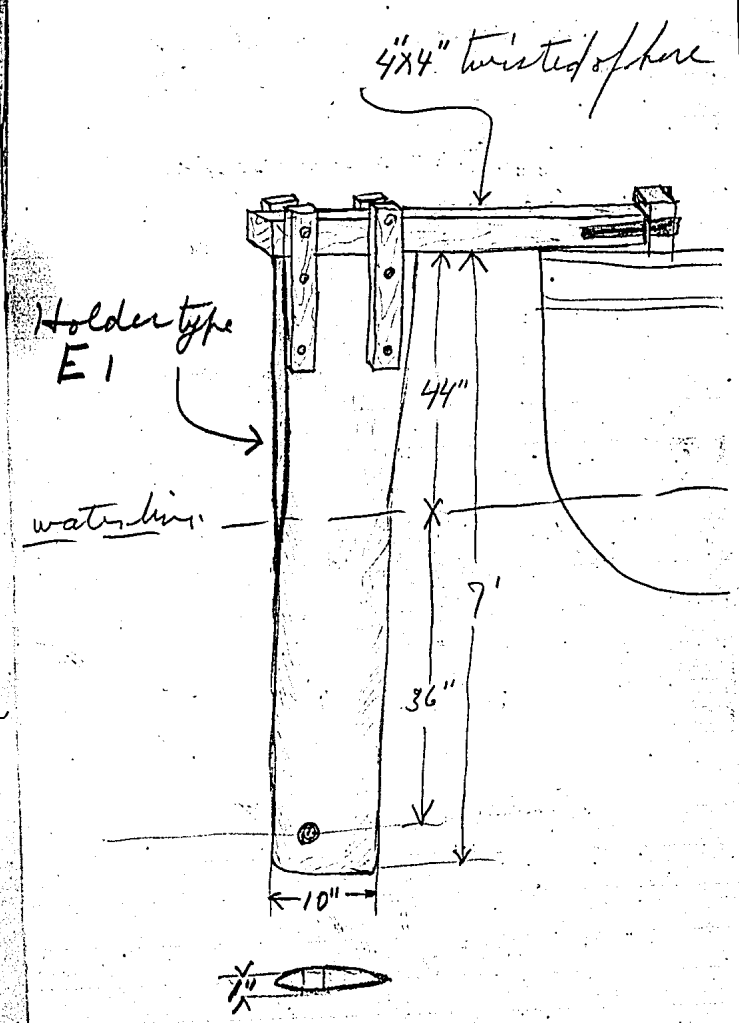
a speed of between 4 and 5 miles per hour.

Model wanted to raise to surface.
almost twisted bowsprit of binacle.

Listened in while it was riding at an angle of about 45° was very quiet. Same as when remaining still

Did not increase speed for fear of breaking apparatus.

Found that the ignition system has an inductive effect on audion.
There is a click in receiver when plugs spark.



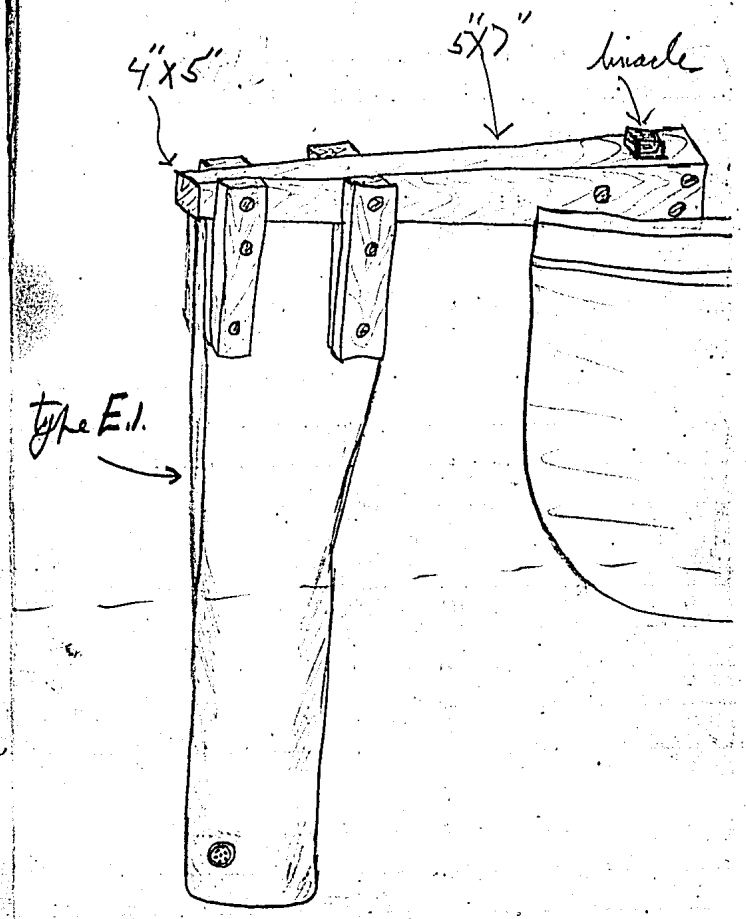
May 17, 1918.

Constructed and rigged up new apparatus as shown.

Tested audion found OK
Tested res.
coil 73" ground 10000000 w

Tested apparatus through audion while remaining still. very quiet. Hoyt and Burns confirmed

Run out with launch at slow speed when making a short turn 4"X4" bowsprit twisted of at point indicated by arrow.



May. 18. 1918.

Made new bowsprit and rigged as shown.

Quite windy and water very rough.

Run out launch and apparatus towed O.K.
Boat pitched and rolled considerable without any undue strain on rigging.

Listened in, seemed very quiet, outside of the inductive interference which is much more pronounced when engine is running on batteries than on magneto.

It is impossible to eliminate this interference entirely due to the location of engine, and the size of boat, which necessitates a distance of inductive range between aerion and engine.

This holder makes a decided difference in the steering of the boat.

Boat turns very hard.

May. 28. 1918.

Tested transmitter preparatory to making running test.

Found that iron diaphram touched magnets.

Put in new transmitter and tested res.

Coil res. 71"

Ground " 10000000"

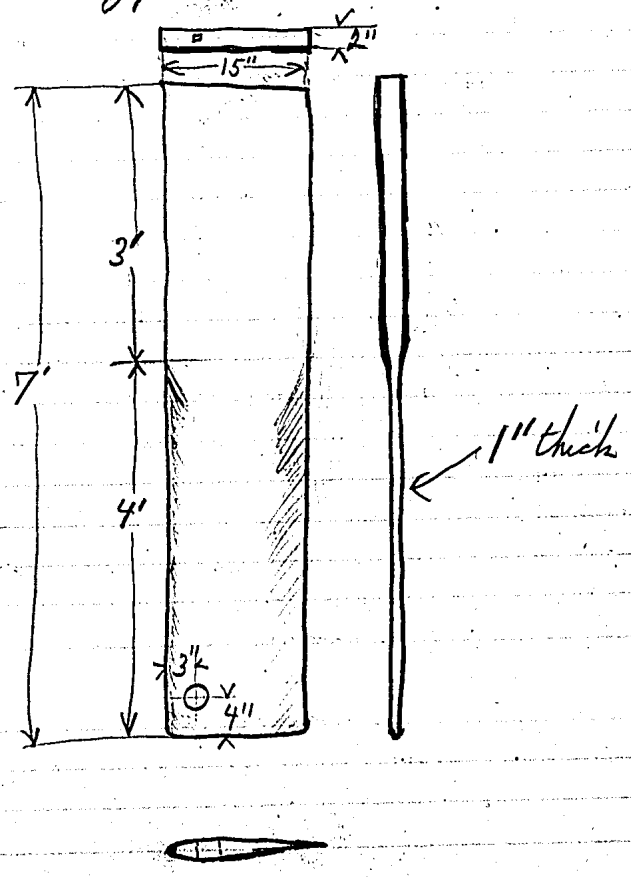
Audion very quiet and sensitive.

Listened in with apparatus and heard water bubbling noises. the water was somewhat rough.

Could hear tug boats very plain over 1 mile while remaining still.

Could hear bell with overtones very clear for ½ mile while remaining still.

Constructed new holder,
Type F No. 1.



Transmitter inserted in hole with rubber ¼" thick surrounding same.

Test No. 1 Holder E, 5/22/18

Audion very quiet and sensitive.

Tested res of transmitter
coil res. 6 ½"
ground broken down.

Dismantled holder and examined transmitter.
Found water in transmitter

After repairing and rigging up again tested res.
coil 71½"
ground 1,000,000"

Apparatus very quiet when boat is remaining still.

Started engine, did not interfere except a slight click due to the induction (engine free)
Got very noisy as soon as boat started.
Very bad water noises accompanied with boat noises
It would be impossible

to hear anything above the noise
(Boat was run at full speed)

Run launch at top speed and shut engine off.
Noise diminished quite a lot, but there was water noise left, which died down as the boat lost momentum.

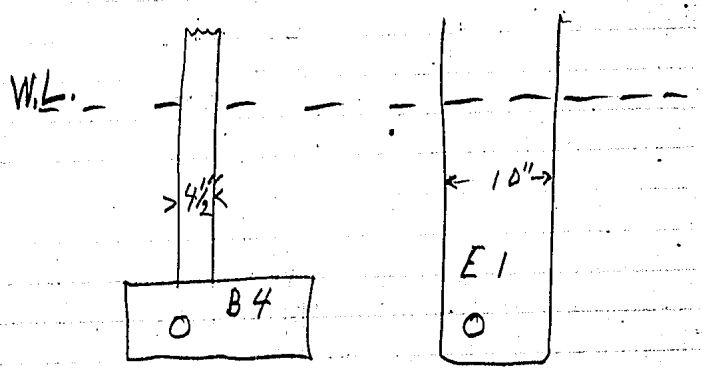
Apparatus seems very quiet when engine is running free, showing that there is very little noise transmitted to instrument through boat.

Gets very noisy as boat gets under way.
Poor streamline form of holder E1 may account for this.

The noises described above were not experienced May. 15. when using holder B 4.

This may also be due to the difference in amount of surface at

the water line, as shown here.



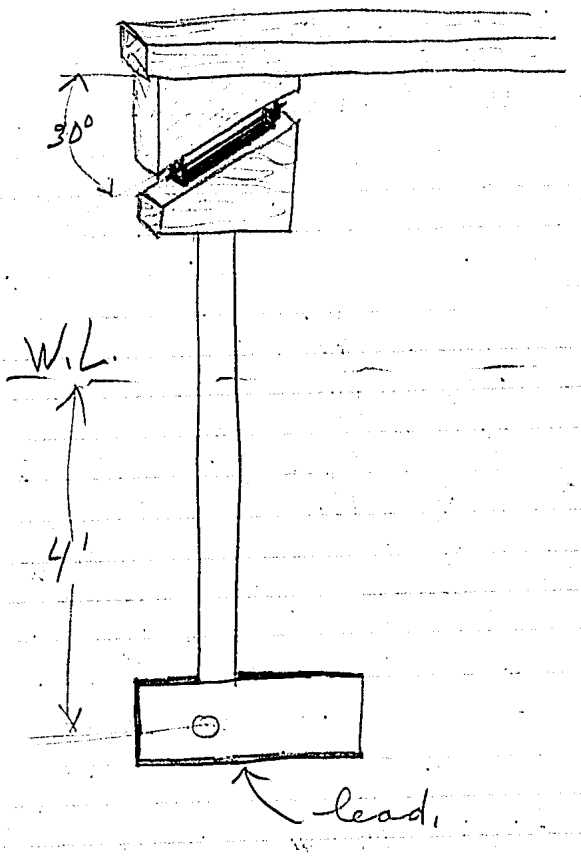
5/22/18

Test No. 2.
Holder F1.

After rigging up F1 and testing rev, found the ground rev broken down and the coil rev about 9".
Due to a defection the insulation.

Made run test to learn riding conditions, rides O.K. but makes steering harder than with E1

Could not hear anything due to the short circuit.



Test. No. 3,
Apparatus B.4.

5/22/18

B4 holder suspended at an angle of 30° as shown on opposite page.

Seemed to ride well going slow, but as speed was increased to 6 or 7 miles per hour would raise to the surface.

There was no transmitter in B4, while used in this test.

The test being merely to determine the possability of utilizing the principal.

The angle of suspension may not be great enough.

5/23/18.

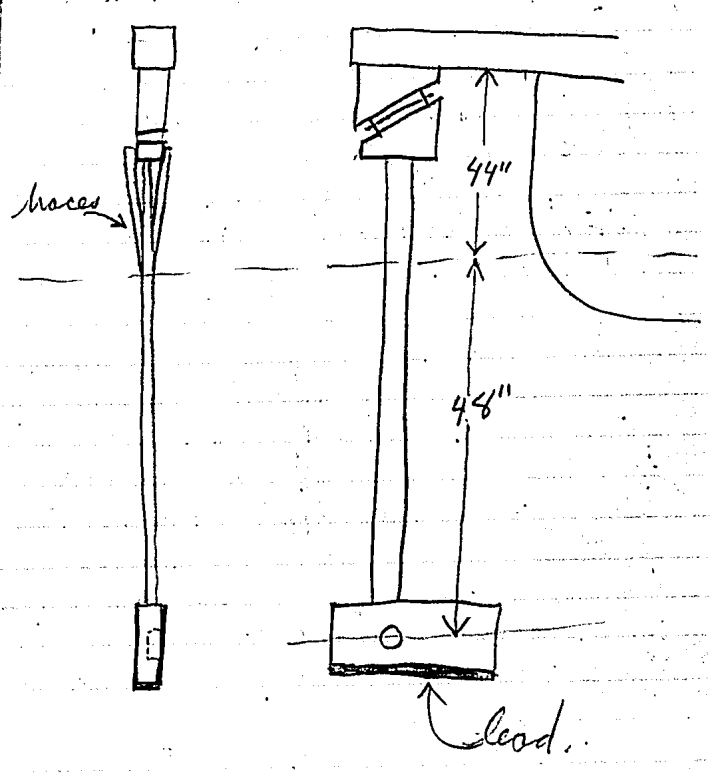
Found trouble in E.I. holder to be due to one of the wires being severed in the insulation.

Repaired and rigged up again and made run test.

Launch engine would not run on magneto and there is a great inductive interference when running on batteries due to the ignition coil.

Water noises not so great as when using E.I. holder.

Looked over magneto and found spring broken



B4 holder.

Test No 1. 5/24/18

Repaired magneto on launch engine.

Made test with F1 (15") holder.

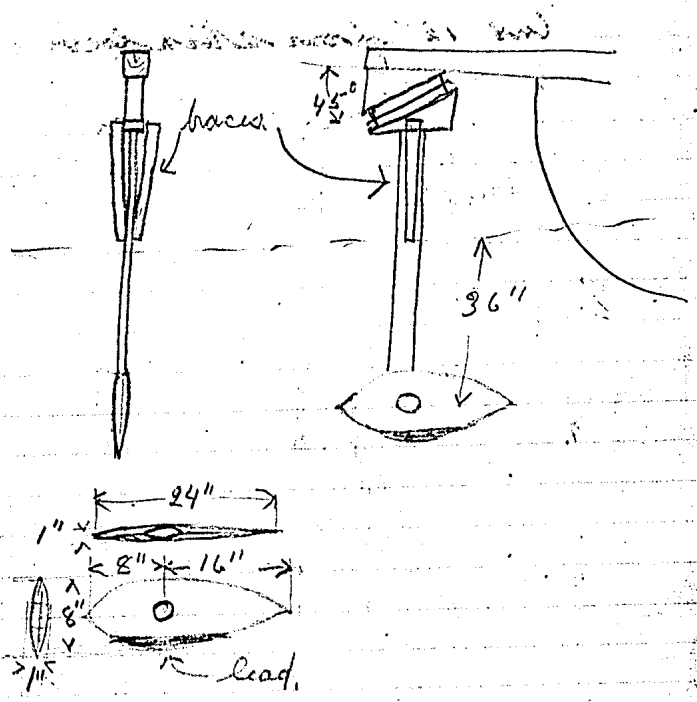
Water noises present but not as much as with E1 (10")

Test No 2.

Rigged up B4 at an angle of 45° as shown in sketch. 1/4" thickness of rubber around transmitter.

It would ride O.K. and remain vertical while going very slow, but when speed increased to 4 or 5 miles per hour it would dart to the surface and go back to the vertical and vice versa due to the flexibility of the stick and the depth of it in the water.

C33



dimensions of type J. No 1. model

Cut 12" from stick leaving 36" in water

Results the same, noisy. Went from side to side twisted of bowsprit.

Test No 2.

Rigged up fish shaped model designated as type J. No 1. (as shown in sketch) 45° angle.

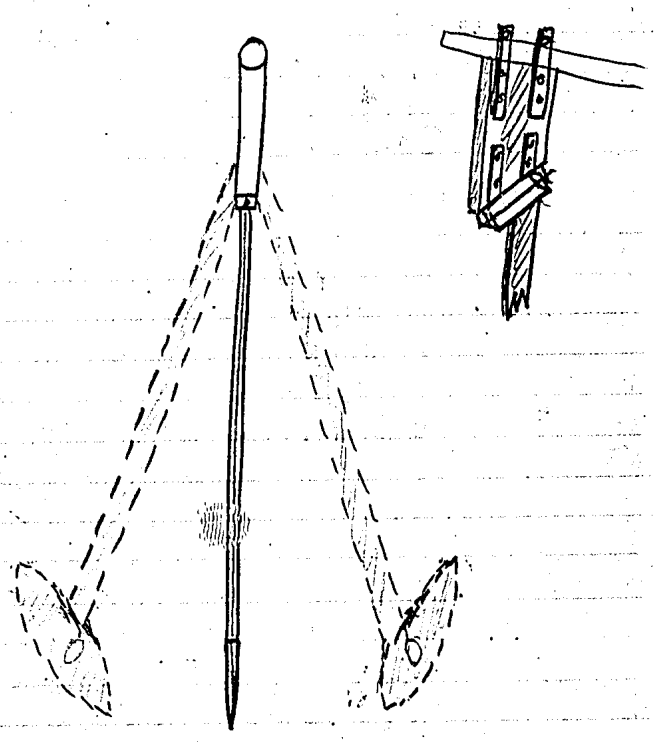
Results were fine. Would ride beautiful and remain vertical at all times, and at all speeds.

Turning boat leaves effect on it.

Rocked boat from side to side, no effect.

No apparent strain what ever.

Effect of angular suspension



Listened in going at full speed could only hear our own boat noises.

Shut engine off while going at full speed.

Very quiet.

Absolutely no water noises.

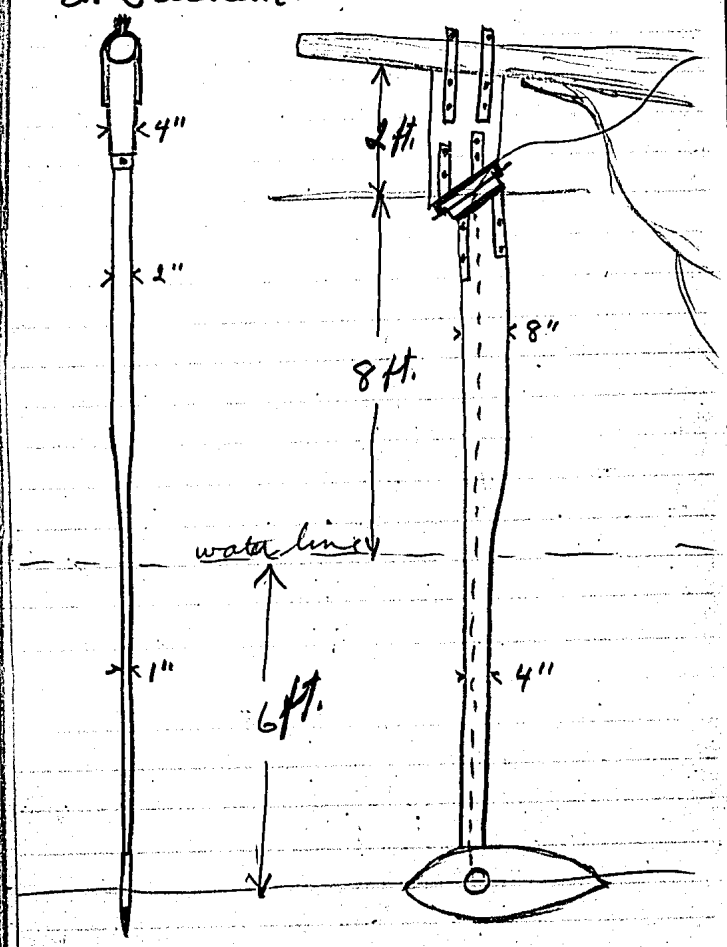
Listened for field could hear going at slow speed for about ¼ mile.

Induction and boat noises drown it going at full speed.

Engine in launch was very good now since magneto was repaired, and there is greater inductive interference than before.

When running at full speed this induction infects audion entirely.

Description of G. 2. apparatus on Sachem.



Description of J. S. Apparatus.

June, 7, 1918.

Suspended J. S. from bowsprit of Sachem, as shown in sketch on opposite page.

Seemed to hang vertical. tide was running at the rate of 1.9 knots per hour.

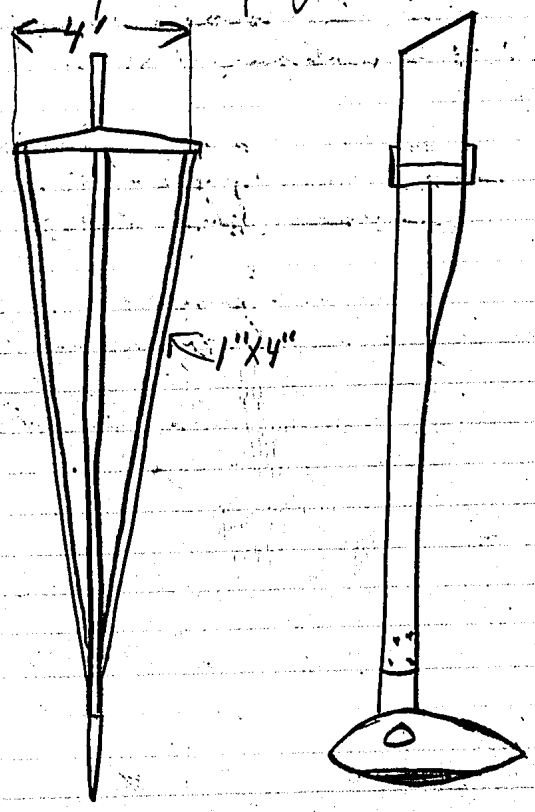
Listened in could hear all kinds of boat noises. Lot of shipping going on. Impossible to get a quietness for any period of time.

No water noises.

Transmitter got water in back of mica diaphram.

disassembled to repair.

Description of J. 2 apparatus, bracing



June 11. 1918.

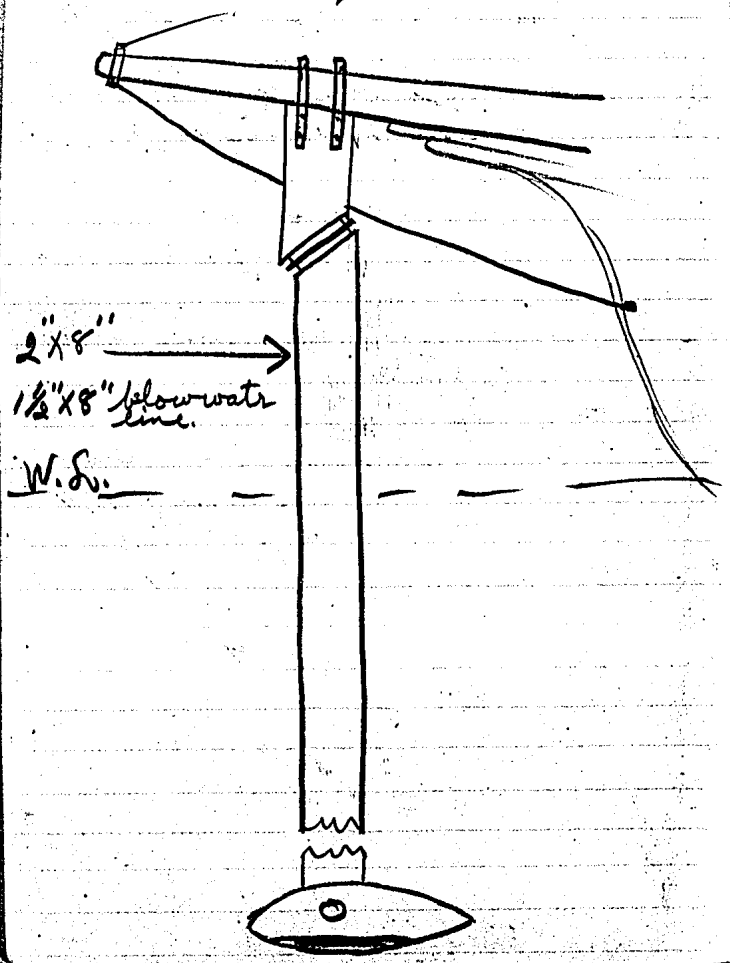
Hung J.2 apparatus on Saetem and made run test at 5 knots per hour.

Model would tend to raise to surface due to flimsyness of upright.

Did not increase speed for fear of breaking gear.

Braced J 2 as shown on opposite page.

New apparatus made to overcome flimsyness of G.2.
This is designated as H.1.



June 15, 1918.

Test No. 1.
Time 9.30 a.m.

Hudson River
N.Y.

Tide running out at the rate of about 2.6 knots per hour
Water slightly rough.

Suspended new apparatus as shown on opposite page, from Sachem.
Tested res. coil 75.5 ohm
ground 10,000,000 ohm

Run up river at 5 knots against tide.

No water noises.
Can hear engine on Sachem. R.P.M. 116

This apparatus rides beautiful, remains vertical except when still. It swings slowly from side to side, but gets vertical when boat is underway.

Increased speed

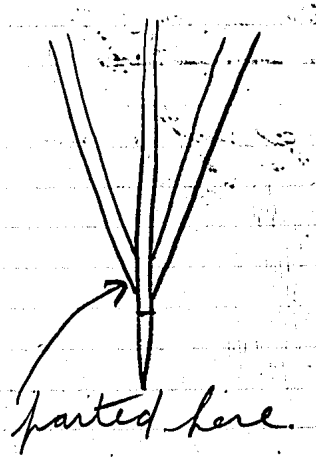
to 7 knots.
No water noises
Very quiet.
RPM on Sachem 128.

Time
10.46 Can hear wireless signals very faint.
Herrald station at Battery Park.

Run full speed.
Very good, no water noises at all.
R.P.M. 151 Engines very quiet.

Turned boat at full speed without any effect on apparatus.
Riders fine at full speed. No apparent strain.

Time.
10.55 Going down river with tide, full speed.
Can hear other ships but there is so much shipping going on can't listen for



Test No 2. June 16. 18.

Suspended braced apparatus G.2.

Run at 3 knots.
Side brace broke off as shown in sketch.

Due to great pressure at that point. I guess.

June 18.

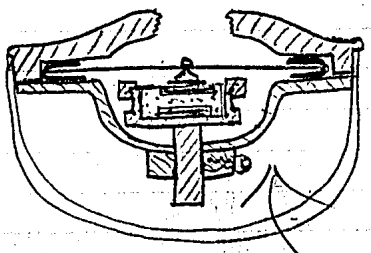
Am constructing the following apparatus for tests at sea.

No. 1. H 1. apparatus as described.

No 2. H 2, as shown on opposite page.

No 3. H 3. shown on next page.

No 4. K. 1.



Construction of transmitter

about 7 times more sensitive than bell tel receiver.

Aug 22, 1918.

After experimenting with various transmitters We found the ordinary bell carbon transmitter (carbon replaced with powdered bacelite with gasoline) to be the best.

This bacelite is powdered through 160 mesh screen and on 180 mesh.

We used 2 cells battery

This seems to be very quiet and sensitive

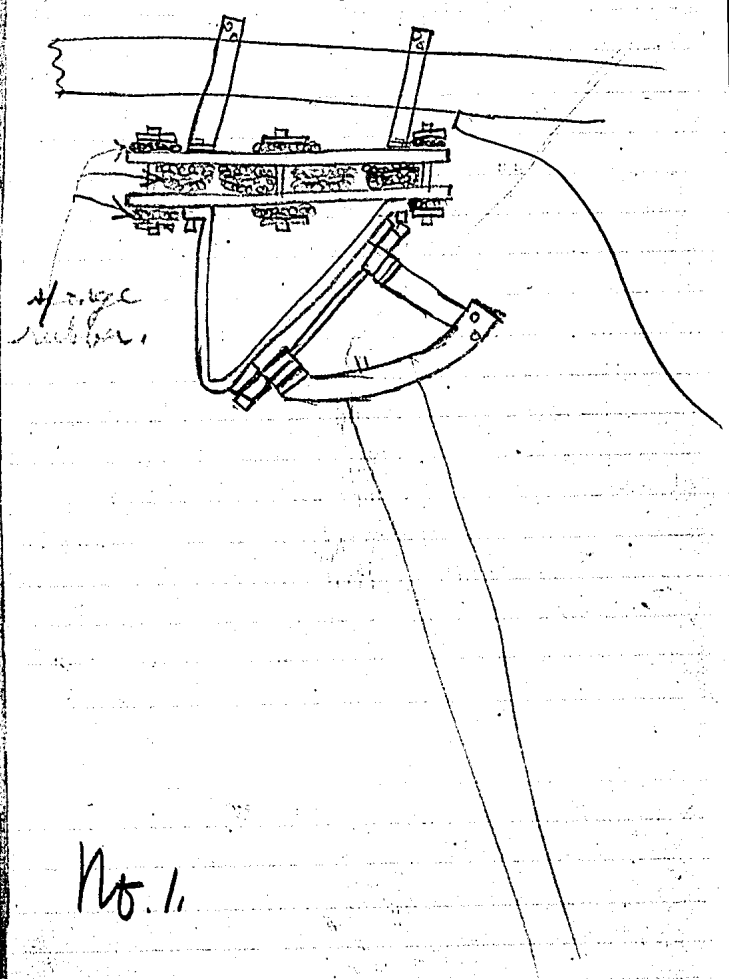
I can hear sub to 400 feet as against with bell tel.

Gasoline is distilled at 95°C. 74 Be.
B.P. 666 C.S.P. 74.3

August, ~~July~~. 13, 1918.

Left Edison Lab. with equipment, reached Hoboken, loaded same and went to 86 St. for provisions for boat, then proceeded to Sandy Hook N.J. reached there 7 P.M. same date

Sandy Hook.



No. 1.

Aug. ~~July~~. 14. 18.

Assembled upper part of apparatus and hung from bowsprit as shown on opposite page.

Tested column for faulty vulcanization and leaks.

I hung it over side of Sachem and let it sit in the water 10 feet deep for over one hour.

I tested for water with a weight on a string which I let drop down through hard column.

I done this so if it leaked it could be taken right out of water without getting much of sponges wet.

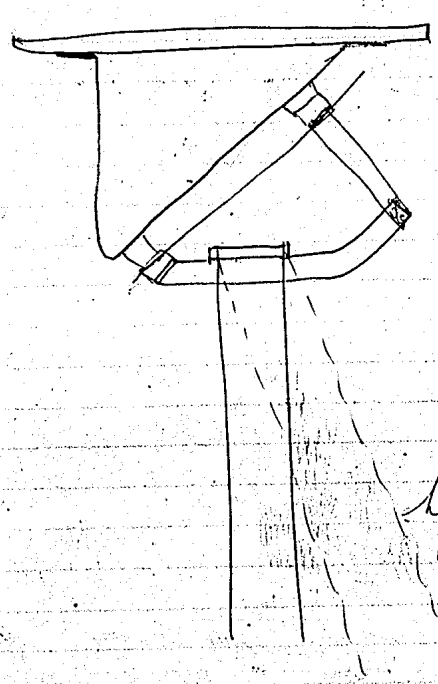
After leaving in the water for one hour

Aug. 14.18.

We took out and turned up side down.

No water came out showing workmanship O.K.

Diaphram also O.K.



Aug. ~~July~~ 15. 18

We left Sandy hook dock at 2 P.M. to make run test.

When Sachem was under way the lower plate twisted and got column out of line.

This due to the yielding nature of the rubber sponge. Brass column also wedged loose from clamp as shown by arrow.

We run at 10 knots and listened in direct but, apparatus very quiet.

We could only listen a few minutes, because twisting of column pulled of rubber tube connection.

We could hear our own boat plain and there was no water

Am going to change upper structure to make it more practical mechanically.

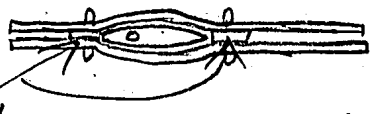
Aug. 16, 1918.

I am having made by the Combination Rubber Co. 50 ft. of 2" rubber hose, for lead in tubes.

This is 3 ply canvas inserted.

The cheapest grade of hose they make.

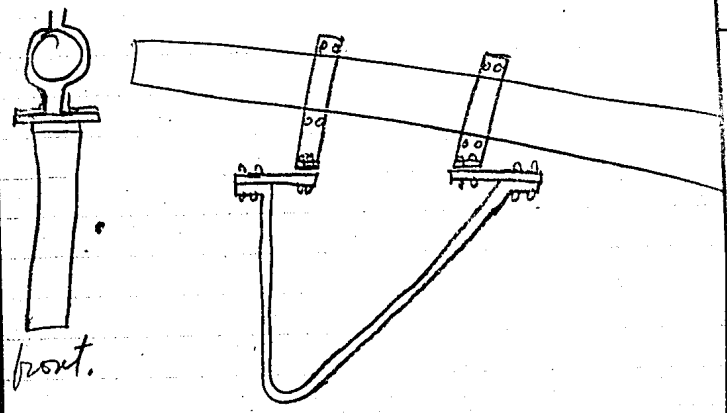
They promised it for Tuesday Aug 20.



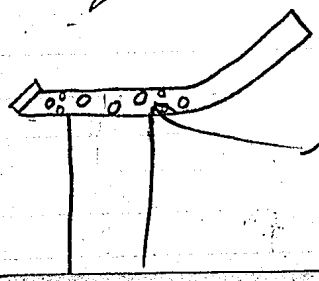
these pieces also keep it from wedging.

Aug. 19. 18.

I done away with the large plates on upper structure and built it up as shown.



Also screwed clamps to base column so it would not wedge out.



like this.

Aug. 20. 18.

Rubber hose arrived. We made elbows and connections for same.

Rigged up Audion.

Covered foothwith cheese cloth.

Charged all batteries.

Sachem went out, Captain Harris seen the Clio Commander about testing sea anchors.

We anchored in N.Y. harbor over night.

Aug 21 8.,

Left N.Y. harbor, with Cleo, sailed up Sound to Rye Beach.

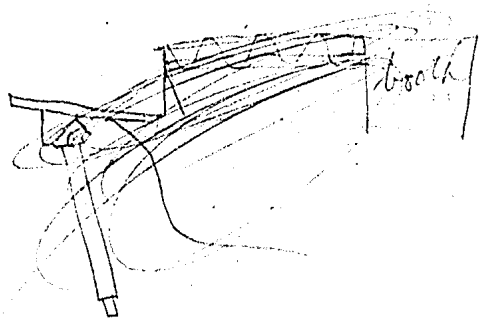
Captain started sea anchors.

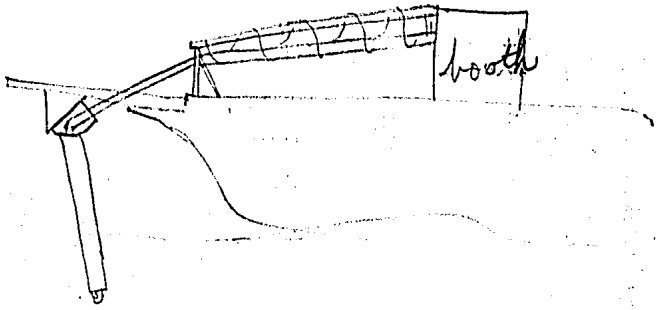
Laid off rye beach all night.

Aug. 22.

Left Rye Beach for N.Y. stopped at E 23rd St Mr. Flemming off. got water etc.

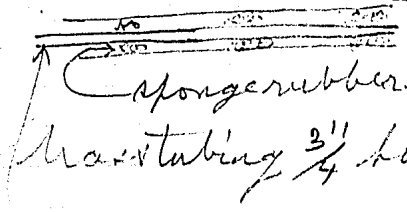
Went back to 8 6th St. instructed Captain to store up, and be ready to go to Sandy hook Monday morning early.



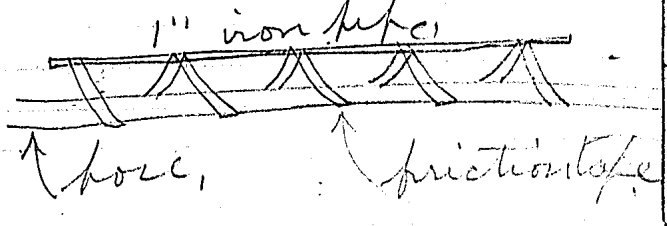


Aug 26 '8

Construction of [illegible] tube from [illegible] column to audition booth



Method of suspending hose,



Aug 26. 18.

Reached Lampy hook at noon, put hicky on and hooked up.

Got every thing ready for a run test.

Left hicky on over night for leak test.

The distance from top of column to gal. pieces is 50 ft making a total of 616 ft from diaphram

Sandy Hook, Aug. 27. 18.

Made run at 5 knots.
Listened in direct with ear tubes.
Sound very quiet.

Can hear the beats of the engine on Lachem.
They are very faint and seem to be regular, vary from about 220 to 248 per minute.

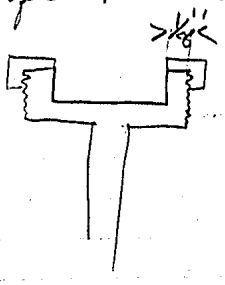
There is no continuous roar like we used to get before with wooden hoods.

Hitchey rides to the port side a few degrees, this is due to improper alignment.

We come in to dock to correct this before attempting to run at faster speed.

Run out again at 5 knots.
Rides vertical. G.K.

I made a transmitter with the granule cup having a surface of 1/8" formica diaphragm



regular cups have only about 1/32" surface

Increased speed to 10 knots
It rides better yet.

Listen in again direct with ear pieces.

Hear Sachem plain, no other noise.
beats are very fast difficult to count.

Hickey makes a terrible disturbance in water near water line, due to improper streamline form (to blunt nose)
This noise is very loud when listening in the air at bough of boat.
But cannot be heard in ear tubes.

This construction is great for eliminating the water noises.

We now run abreast of an American cargo-boat, (just like the Cleo)

We are carrying Her on our port side - because that is the side our diaphragm is on.

We count 330 beats per minute, these beats are very sharp and plain and drown our own boat

Count 336 beats.

We are dead abreast and about 20 yards away, running at 10 knots.

We now shear off from Her at an angle to see how far we can hear her.

We signaled Him for R.P.M. He said 70,2

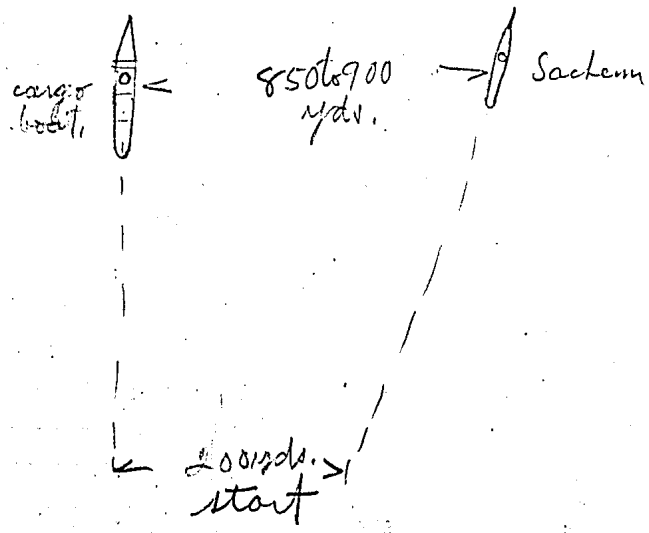
We get 330 to 336 sharp distinct knocks

We loose him at about 850 to 900 yds.

He is going in to harbor We had to leave him.

We could not discern his noise from our own after 850 to 900 yds.

We get distance with sextant on the bridge.



Sachem engine turns 140 R.P.M. at 18 knots.

We count about 300 beats per minute.
They are about the same intensity, and occasionally a stray knock comes in.
There is 2 beats to the R.P.M.

It seems as though we cant do much with the cancelling apparatus.

We are now running abreast of an oil tanker about 1100 yds away.
Beats are below 96 per min.
Name of ship (Atlantic)

We ask captain for R.P.M.
He says, about 105

We get 96 again.
At Our boat sounded

like this, We couldnt
it out. as the beats are low
frequency.

We loose when when
at 750 yds.

Sachem is pitching
some, apparatus sinks
and fall in water about
10 feet.
This does not bother
at all.
It changes the quality
of the noise a little.

We now run abreast
of another cargo boat.
Name is (Toronto Hull)
We count 72 R.P.M.
Very clear.
We asked Captain for R.P.M.
He says 70.
We count 72 again.
We are 150 yds away
We now hear of and
loose him at 700 yds.

These boats are very loud in comparison with Aachen,
perhaps it is because we get the sound from them at right ang. to the diaphram.
Where in the case with Aachen the propogation of sound is in line with diaphram.

We beast another oil tanker (Raritan).
Count 108 R.P.M.
Captain says their R.P.M. is 110
We hear of and hear to 700 yds.

We now run abreast of a tug.
Hear to 600 yds.
count 228 beats.

We now beast a whale back oil tanker

(Great Lake type) (name: City of Everet)
We count 73 R.P.M.
They tell us 73 "
We hear to 700 yds.

We now heard a passenger boat (Maricaibo)
count 264 beats.
Hear to 750 yds.

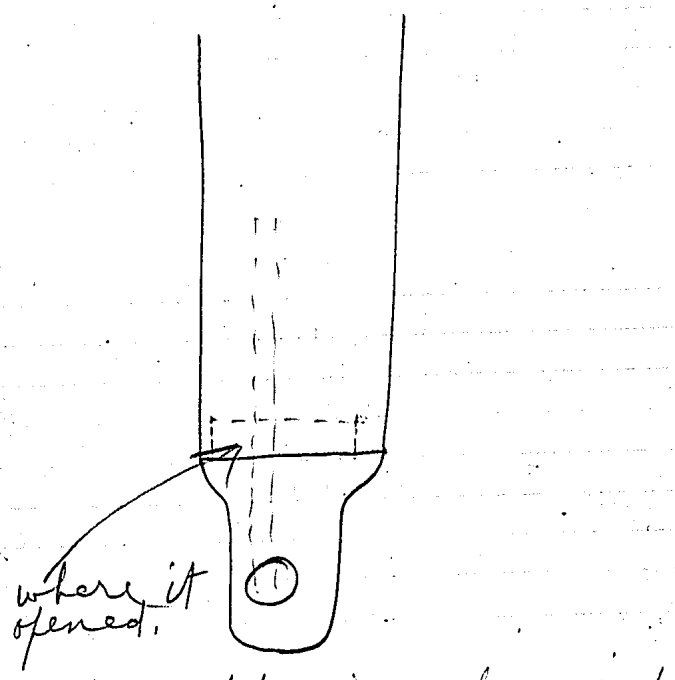
The above data is correct as Hayes and myself verified each other in each case.

We now go into ~~Hardy~~ hook dock.

I took of apparatus to examine.

Found that the vulcanizing gave way at bottom of pitchy and let water in.

~~We did not notice this in listening.~~



It seemed to lack its absorbing qualities in spite of the fact that water got in.

We will have to squeeze water out and reconstruct bottom to be stronger mechanically.

Meantime I am getting proper brass netting to make new streamline form of fairing.

Sept. 9. 18.

Repaired detector and prepaired to go to Sandy Hook.

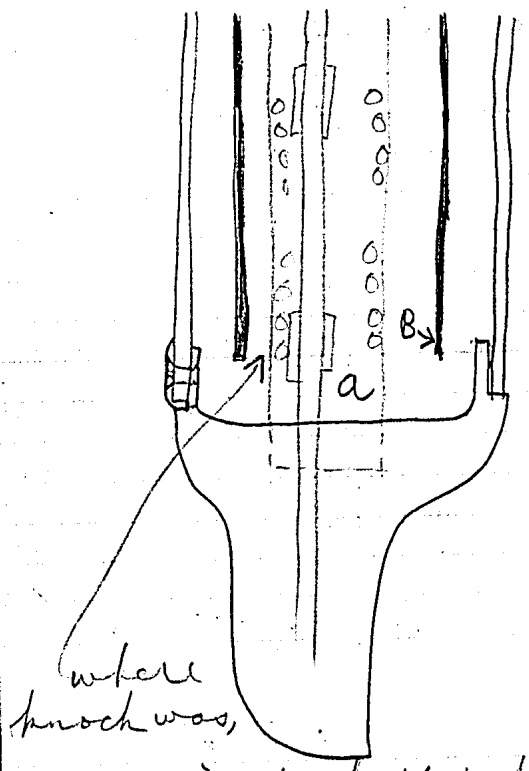
Sept. 10.

Left 86th St. 8 A.M. reached Sandy Hook 10.30 A. hung detector and went out on run test listened in direct with ear tubes

Could hear Lackens engine

There is a knock I think its due to the horseshoe on bottom lifting column, this knock is very rapid and it is impossible to do anything.

I had a man go overboard and try to work the rubber cover down so that shoe would clear.



vulcanizing filled sponge rubber and brass marked a. hit brass column marked B, due to vibration of the column riding in the water

Sept 10.

This did not seem to do any good.

We had to come in to dock and take of detector

Disassembled lower part found water in and also the reason why we got the knock.

Repaired and did not vulcanize bottom again instead put white lead in and screwed on clamps.

Sept. 11. 1918.
Sandy Hook.

Run out at 10 knots if Hayes counts 200 beats, engine is turning 156 R.P.M. I get 312 beats.

There is nothing sharp or definite about them.

(We are listening direct with contacts)

Knock We experienced yesterday is gone.

Put on Micro. with gasoline in granule cup.

Cant distinguish anything.

Continuous roar.

Try Bell telephones We can try canceling

We hear the beats very plain, but they are in very rapid succession and ~~the~~ are all the same

in intensity,

Cant do anything in the canceling line on this boat.

Sachem is going in dry dock for repairs.

Meantime I am constructing new detector with better streamline form.

Purchased 18 ft of #20 Mesh Brass wire .015" to reinforce rubber for new detector.
24" wide.

Also brass wire 25" wide 12 mesh #21 wire.

Had this rubber made with wire insertion by the Manhattan Rubber Mfg. Co. of Passaic.

(10)

Nov. 15. 1918.

Left Edison Lab. with experimental equipment for Sachem, lying at ft. of 79 St. N.Y.

Nov. 16.

Find things in very bad shape on Sachem. Will take 3 or 4 days to clean and straighten things up before we can leave for Sandy Hook.

There is no batteries on Sachem, same being in factory for repair. expect them return anytime.

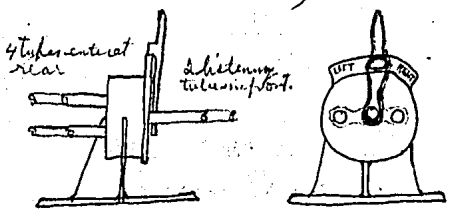
We cannot have light without dynamo running

Nov. 18. 1918.

Am getting the wing & diaphram apparatus ready for experiments, also getting old wing diaphram apparatus ready to make comparative tests.

I am having made in the lab a double throw-by valve so as to make it possible to hear a boat on both the left and right side, or the left or right side seperately.

This valve is to be used in connection with the 4 diaphram affair (2 diaphrams on each side.)



When lever is in center position both the port and starboard side leads to the two ear tubes. if put to the left side or right side only the respective diaphrams in apparatus will lead to ear tubes.

inside drum showing construction

Nov 18 1918.

Left 86th St for Brooklyn Navy yard to put off sea anchor.

We will wait here for batteries as we can have the Navy Yard people install them here!

Nov. 21.

Left Sachem for Lab with spectroscope for Mr. Edison. returned same day.

Nov 22.

We decided to borrow batteries from storage battery Co. so that we can go out Monday. We went home for Sunday.

Nov 25

Returned to Sachem and proceeded to Sandy Hook. got things ready to make test Tuesday with old apparatus No 1.

This is the first model we made.

Nov. 26.

Suspended apparatus from bowsprit, and rigged up tube to booth from same.

I am using a taper tube tapering from 1/2" to 3/4" 3 ft long from top of hickey.

I use the same size tube at booth end tapering down from 3/4" to 1/2"

Everything is ready to make a run test tomorrow.

It was too late to make a run test today as it got dark at 4.30 P.M.

Nov. 27.

We run out from dock at 5 knots speed.

Hayes is listening.

Apparatus seems to be in line, so we increased speed to 10 knots.

Hayes says he can hear the Sachems beats plainer than he could before (in previous tests)

We were running at 10 knot speed for about 10 minutes when brass column doubled up. it bent about 2 ft below suspension.

Upper structure must have been disturbed as it was left in perfect alignment.

Captain Harris said tug boat hit this structure while at the Brooklyn Navy yard.

Water was quite choppy but not near as rough as when we made the previous tests with this same apparatus.

We went back to dock and removed apparatus and then proceeded to 79 St. to go home for thanksgiving.

Nov. 29.

Went to Lab and reported results to Mr. E.

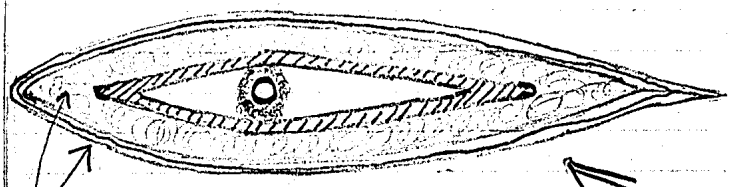
I intended to stay out until all experiments were completed, but was hurried by the Captain and Officers to come in for Thanksgiving.

Mr. E. sends for the Captain.

Nov. 30.

After discussing conditions with Captain Harrison Mr. E. library, and the Captain having agreed to

The No 2 apparatus is the new single tube affair with the brass wire inserted rubber on the out side.
diaphram is on the Port side of boat.



This rubber is 5/32" thick and reinforced with #20 mesh brass wire .015"

Sponge rubber made by the Miller rubber Co. 20" sq. 3/4" thick.

remedy things We arranged to go aboard Sachem Sunday night and go out to hook Monday morning.

Dec 1.
Met Hayes and Burns and proceeded to Sachem arrived at 10. P.M.

Dec 2.
We left 9st at 8.30 A.M. arrived at Sandy hook at 10.30 A.M.

We got our No. 2. apparatus ready and put same on.
I let it stay in the water for dinner time in order to get a test for leaks.
After it was in water about 1 hour I tested by letting a weight tied onto a string and let same drop down into the outer casing and then in the conducting tube.

Found that the casing did not leak.

Found water in conducting tube. (diaphram leaks)

Raised out of water and could not find any reason for it leaking.

Probably it was not screwed in tight enough.

We cleaned all water from tube and put fresh white lead on diaphram holder and screwed down tight and put hickey back in water again.

After leaving in for a while made test again.

Still leaky.

Removed from water and examined.

Found that holder fits in loose (due to poor workmanship)

I found one out of a number I had made, to fit snug.

We assembled again using this holder, and tested, out of water by blowing through tube.

A strong person can blow about 1.5 lbs. per sq. in.

I put soap water on dia. seas to detect any leak.

The area is about ½ sq. in. the pressure on this is about 1.5 lbs. at 6 ft. depth.

The pressure it stood without leaking was 3 lbs this leaves a safety factor of 100%.

This is ready to put on tomorrow morning.

Darkness sets in at 4.30

Dec. 3.

Tested diaphram for leaks before putting on, by having Hayes blow in tube and putting soap water on diaphram to detect leaks better.

Found O.K.

Put detector in position and lined up with the bow of the boat when the former is in a vertical position.

This lining is done by sighting with the eye.

We now start out from dock at 5 knot speed.

Time 2 P.M.

Weather is very calm.

Hayes is listening direct with ear tubes.

We have a 3 ft long taper tube (1/2" to 3/4") on the hearing end and from top of column to conducting tube which is 3/4" tubing all the way to booth.

Column rides fairly good, It is just a trifle off to the Port side.

It seems to ~~leave~~

quite a wake in spite of the streamline form

Hays says He counts 240 beats of Sachem.

Her Rev. at 5 knots are 120.

There seems to be a steady roar of a very low character which makes this model more noisy than the old No. 1.

The beats are not so clear.

Increased speed to 10 knots.

The wake is far greater. in fact almost as bad as No. 1.

The noise also increases

It being a little out of line may cause this, so we come back to dock.

It gets dark at 4.30 P.M.

We correct alignment so as to be ready to go out the first thing in the morning.

Dec 4.

I left colum on all night and am going to test this morning for leak before We start out.

Find casing and tube dry.

Leave dock at 9 A.M.

Go outside the Hook to listen for ships.

We are running at 5 knot speed.

Water is verry choppy and rough.

Sachem pitches and rools a lot.

Hayes is listening.

Listens noisy.

Rides vertical.

It seems to be in perfect alignment now.

Increased speed to 18 knots.

Noise also increases cant count beats of Sachem

I dont think We could hear any boats with this noise present.

I listened with my ear against different parts of the structure on bowsprit to learn if any moving part made a noise.

Find everything O.K.

I decided to run this noise down.

We disconnected lead in tube from top of column and plugged with a cork to learn if it was the effect of the wind (which was blowing strong) on the rubber hose casing. (This casing being offered to the wind)

Listened very quiet showing this was not the cause.

We now connect back again and shut of engine instantly and let boat go under her momentum.

Noise diminishes as the speed of boat diminishes.

When boat comes to rest this low roaring stops and the only noise is the circulating pump, which is very faint.

When this pump is shut off, there is absolute quietness in air tubes.

This pump circulates

the salt water around condenser coils, and has to be in operation at all times.

It can only be stopped for a few minutes at a time.

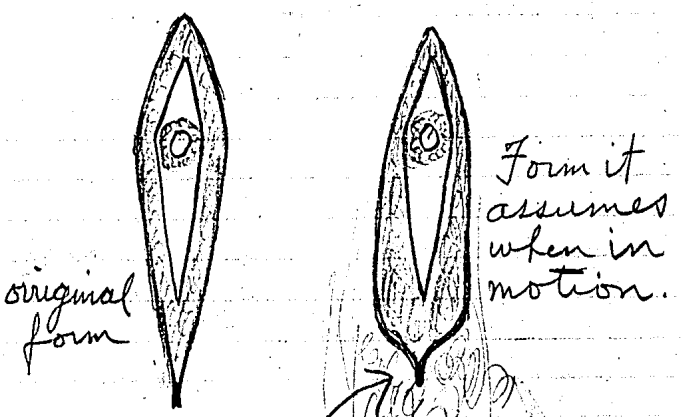
We now start again and speed up to 10 knots.

Sachs engine is very plain at first, but as soon as the boat gains speed the clearness of the beats are lost, and it results in this roar.

The noise seems to be what we got with the old wooden models, only of a very low quality.

This is reasonable because of the reflective nature of wood conduction and rubber conduction.

I repeated this stop the engine tests 3 times and each time the results were the same as above.



Terrible wake and splash here when going at 10 knots. This is the noise we hear. It is so great that the sponge rubber won't absorb it.

As a result of the foregoing tests I come to the conclusion that the noise is due to the splash and wake of the column running through the water.

This makes an awful noise in the air when listening at the bow of the boat.

Weather now is very rough.

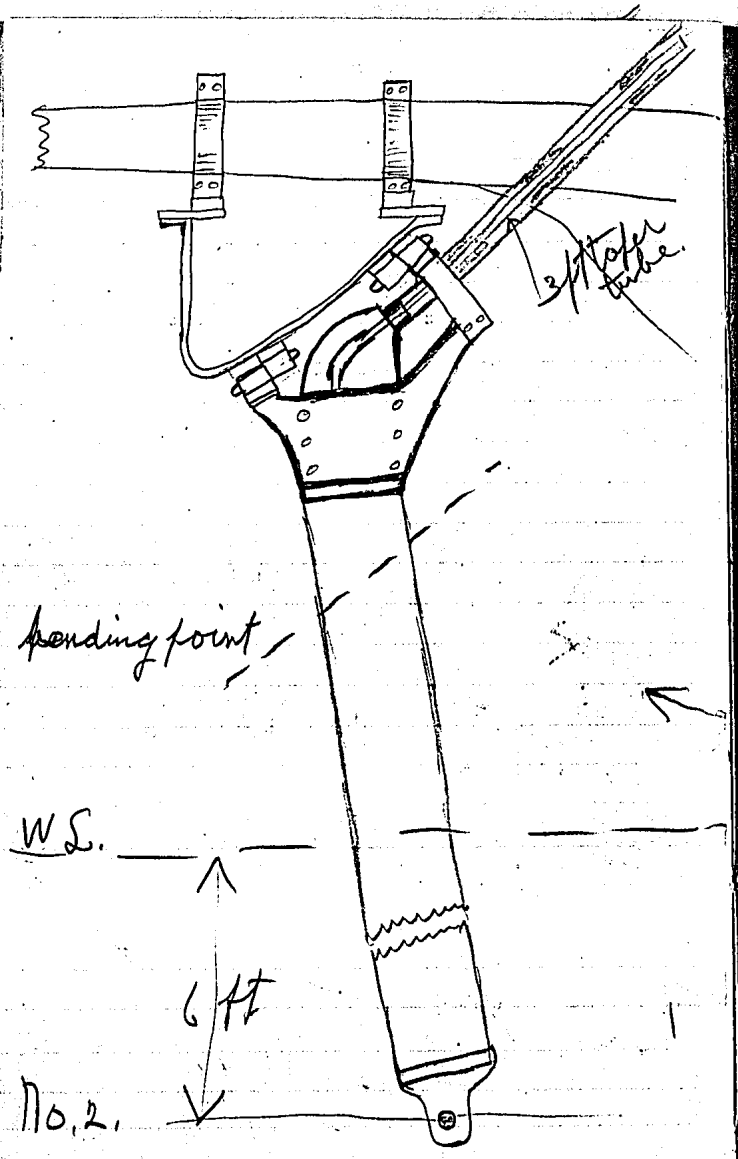
Sea is a storm brewing.

The apparatus comes completely out of water at times, when boat pitches.

I noticed when it comes up and down in the water that it is deformed due to the pressure of the water on it.

The wire insertion in the rubber is not stiff enough to counteract this pressure.

The size of this wire is #20 mesh and .015" hard brass wire.



We were about to come about and the boat gave a pitch that lifted column out of water about 2 ft. and when it was going back it bent about 1 ft below suspension.

This is what happened to the No. 1.

Both bent the same way and in the same place.

There is a terrible strain at this point when boat is pitching and running at 10 knots.

We pull up model along side and go into dock and remove

I am getting No 3 model ready.

The wire insertion in this one is 12 mesh #21 brass wire.

This is much stiffer than No 2.

I am sure it will not deform due to water pressure.

I will not go out in rough weather to make tests with this one, as it is not constructed strong enough to stand great pitching.

Meantime we are going into Base 6 at Benarchurst to get some provisions. We lay at anchor here all night.

Dec 5.

Left Benson hurst for Sandy hook dock at 9 A.M.
It was so rough that we could not make dock so we anchored off hook.
Captain wanted to go to U.S. Supply base to get some supplies. We ordered some time ago.
We left Hook at 1 P.M.
We are ready to continue experiments with No 3 as soon as the weather is favorable.

Dec 6.

Left 24 St. and went to Brooklyn Navy yard to get (mole supplies)

Come back in to 24 St in the afternoon.

Terrible stormy today 70 mile an hour gale blowing at hook.

Hayes and Burns left boat at 4.30 P.M.

I left for home 7. P.M.

Dec 7.

Went to Lab to report to Mr. Edison.

He said column should be long enough so as not to come out of the water when boat is pitching.

Returned to Lachem.

Captain said storm warning was repeated at 4.30 P.M.

Went Home for Sunday.

Dec 8.

Returned to boat 8.30 P.M.

Dec. 9.

We left 24 St. at 8 A.M and went to the Brooklyn navy yard. to get a prisoner and some boxes I had made to convey rubber hose in. (watered up also)

Left yard for Sandy hook arrived there at 10.30

Fitted diaphrams in No 3 detector (4 tube, 2 on each side) and put over side of barkam for leak test.

After leaving in water 1 hour I tested by putting weight with string in tubes and casing.

Found casing O.K.

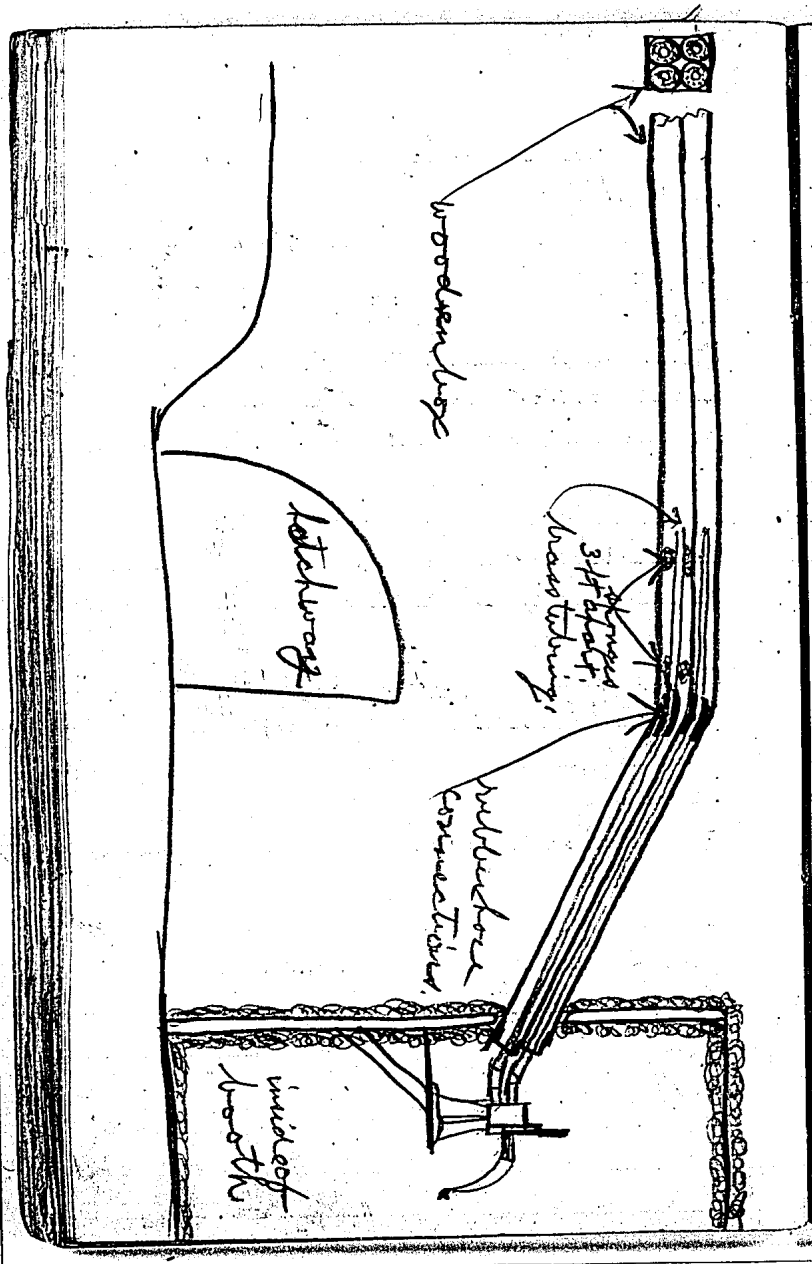
Found that 1 diaphram leaks.

We take out of water and repaired, (It was not tight enough) and put back again,

After it was in water for 1½ hours, made test again.

Found everything O.K.

Rigged up wooden boxes from booth to bow of boat.



I am putting sponges 3 ft. apart.

On account of hoselying in wooden boxes 1 sponge every 3 ft. is sufficient to hold brass tubing in center. It also increases the outside sound absorbing qualities.

Dec 10.

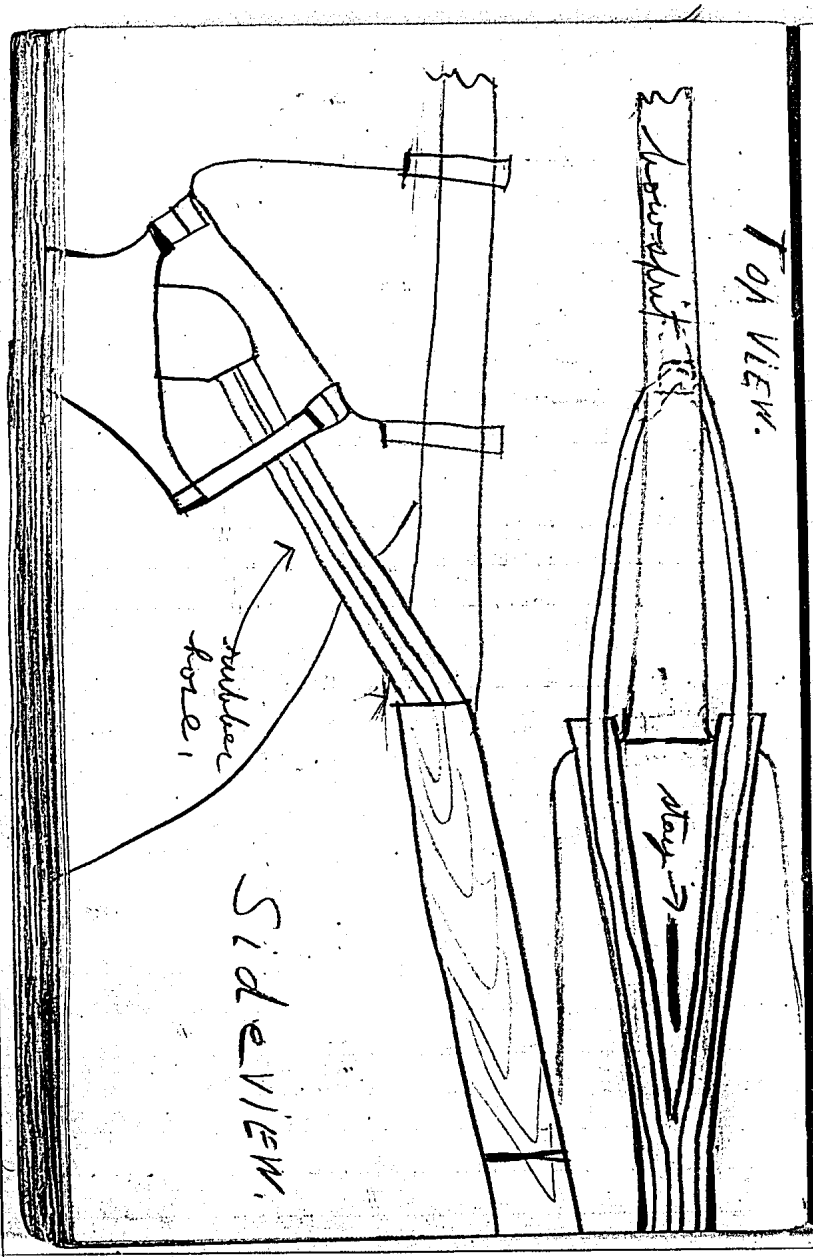
Stormy to day, would not take any chances.

Dec 11.

Very stormy and raining all day.

Left column in place over night.

Tested in morning of Dec 12. everything OK!



Dec 12.

Very calm this afternoon. We run out at 5 knots speed. Column rides beautiful at this speed.

It is in perfect alignment and leaves but little wake.

Sustained beautiful.

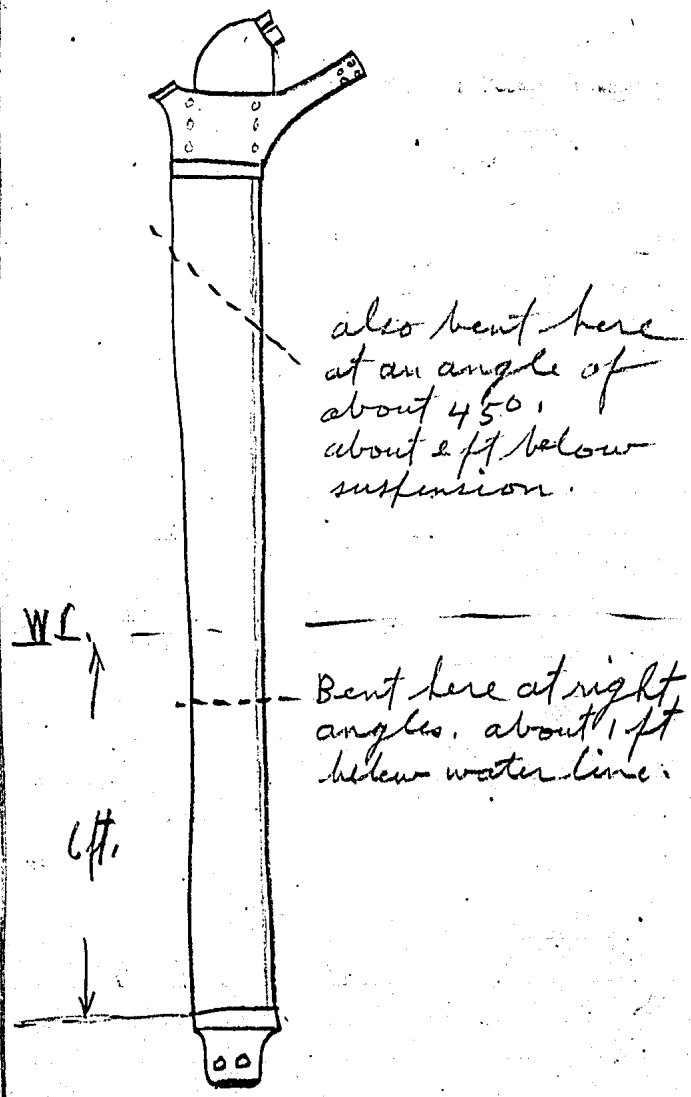
Sackers beats are very clear, the beats of the circulating pump can also be heard very plain.

I listened in each tube to see if all four diaphrams were working. All 4 O.K.

This beats the old No 1 all to pieces, for cleanness and quietness.

We were only running about 10 minutes, and getting valve into place, when column caved in.

It burst in two places.



as shown in sketch.

Returned to dock and removed damaged apparatus and proceeded to 79 St. N.Y. & North river.

We stayed here all night.

Note

This No 3 model held its form fine. It did not deform due to water pressure on the front end when under way.

Note

I think the reason for the breaking is because of the inertia of the upper moving parts.

That is they were not constructed strong enough

to resist the inertia.
The water acts on
lower part verry quickly.

This is proven by the
fact that the old wooden
ones would not break
in any kind of a sea.

There was no appreciable
weight for them to move.

Dec 13.
Myself, Burns and
Hayes left boat for
Orange N.J.

Reported to Mr. E.

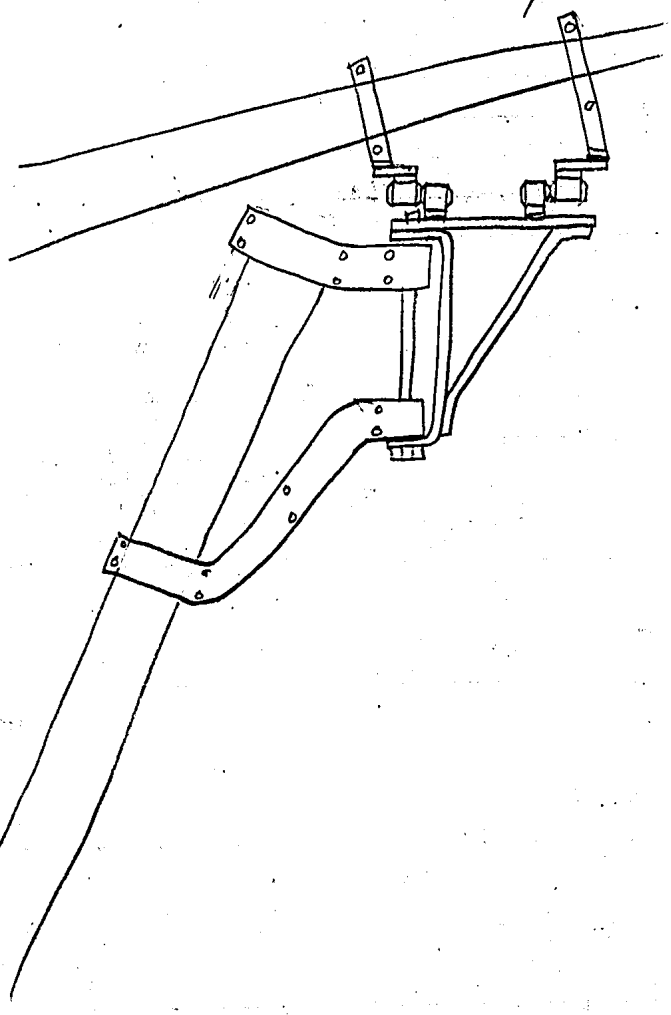
Am going to experiment
to find a better method of
suspension.

Dec 16.
Am laying out some
work to be done in the
Brooklyn navy-yard.

Am in communication with
Captain Harris every day.

Dec 21.
Completed drawings and
went over to factory, then went
to the Navy Yard and got work
started.

New universal suspension.

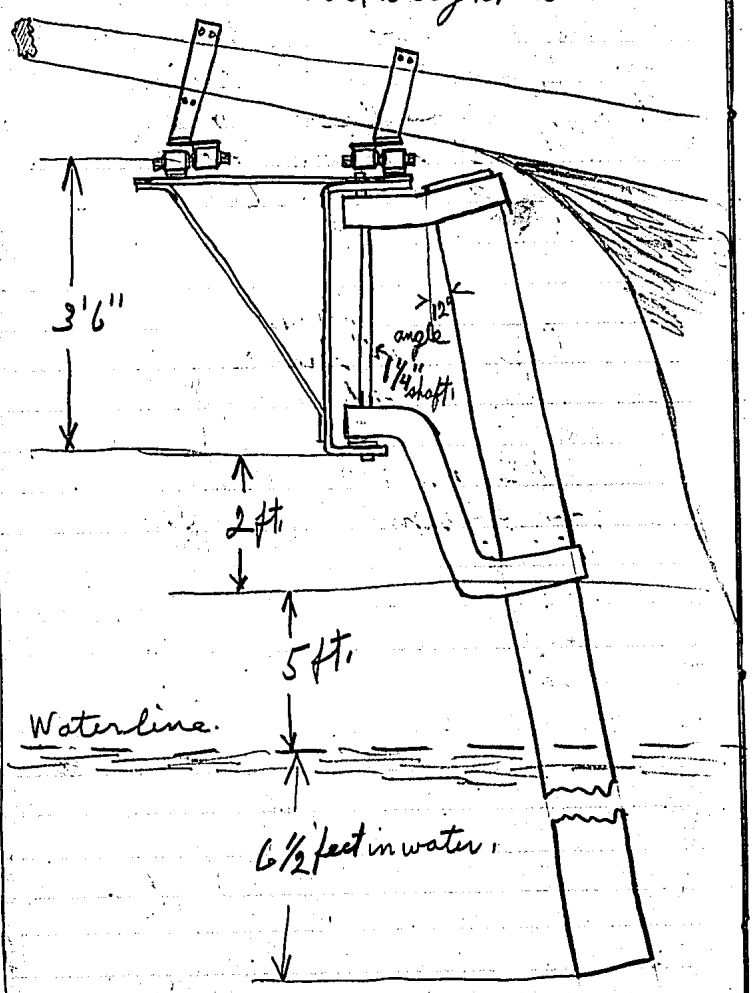


Jan. 2. 1919.

Am getting new suspension in place.
Received all parts of my job from Navy yard.

Rig up for test No. 1 like this.

Total weight 520 lbs.



Jan. 15.

After ship fitters finished work on Jackson We left navy yard, went over to 24 St (pier 52) to get some provisions.

We then proceeded to sandy hook, arriving there at 5.30 P.M.

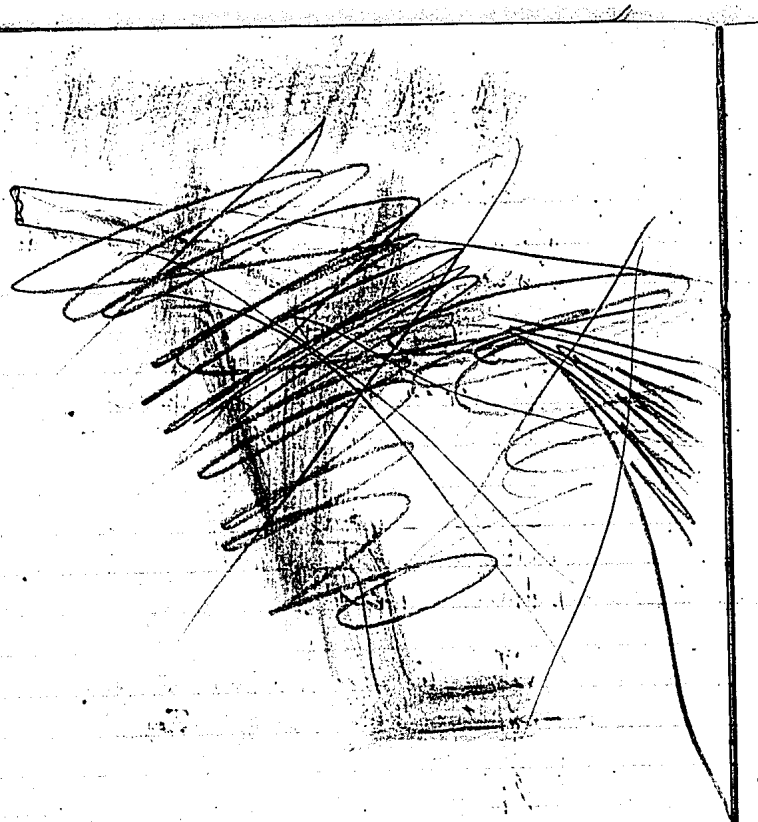
Jan. 16.

Rigged up suspension on bowsprit as shown opposite page.

It is very rough here to day, and makes progress of work difficult.

However got column position before night fall.

Have everything ready for test to morrow.



Jan. 17.

Test No. 1.

To determine riding qualities of colum swinging on a vertical and horizontal axis.

Weather calm.

We left dock and sailed out at a speed of 5 knots

Colum wants to come to the surface, swinging on the horizontal axis.

The two axis do not seem to work ~~together~~ together

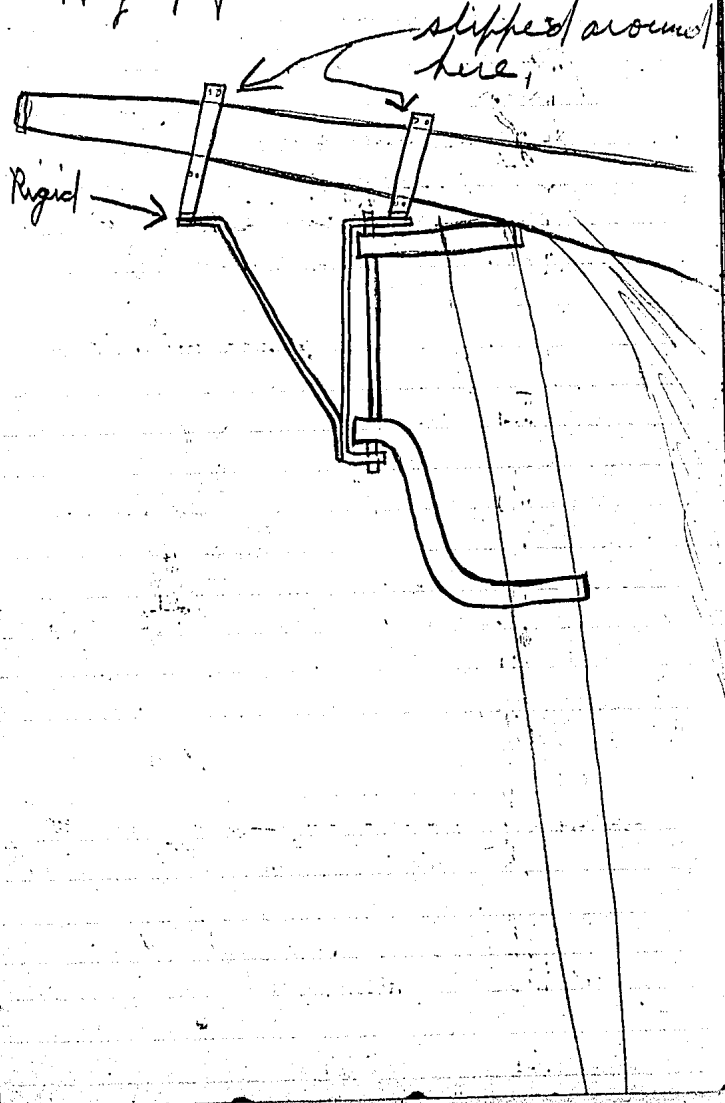
It seems as though it should be rigid horizontaly.

We did not get this effect with small model in lab.

This universal method is (no good.)

We return into dock and prepare for test No. 2.

Rig up for test No 2.



Test No 2.

I removed horizontal bearings and made rigid as shown in sketch.

It is now free to swing only on a vertical axis (Like a boat rudder)

Went out again at 5 knot speed.

Seemed to be O.K.

Increased speed to 10 knots.

There is a tendency for it to come to the surface

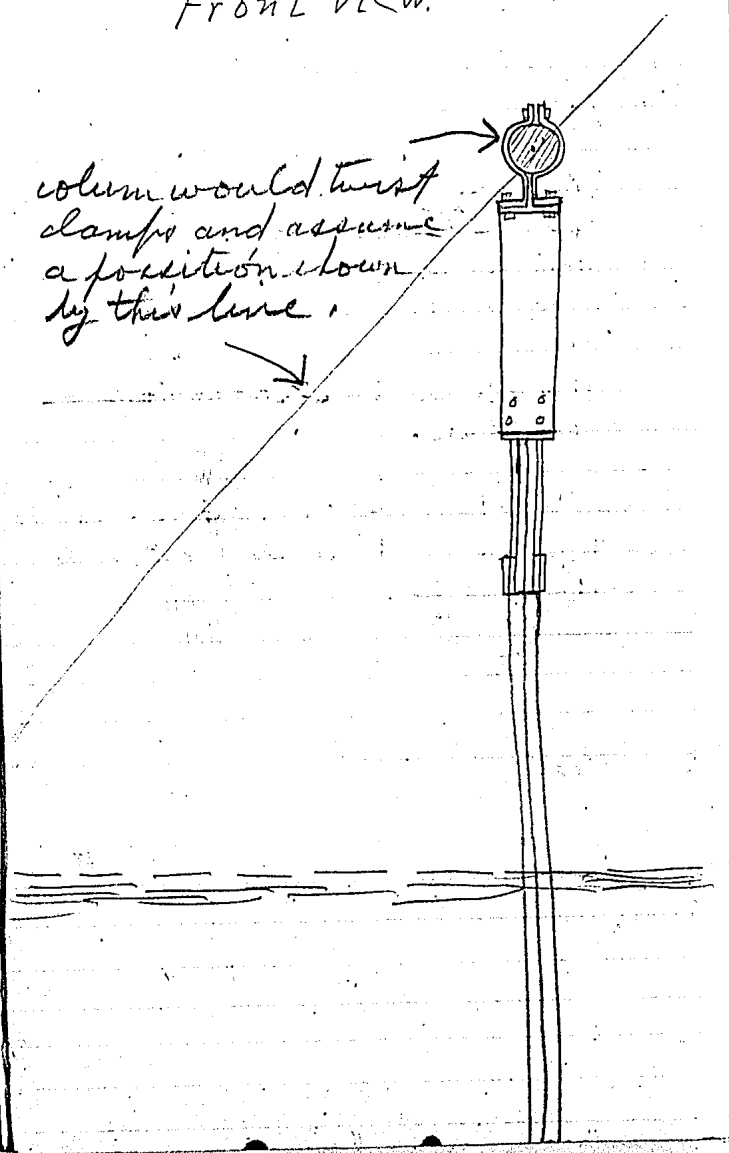
After riding at 10 knot speed for a few minutes it rose to the surface.

It slipped on bowsprit

I straightened it up and tried again at same speed,

Came to the surface

Front view.



again.

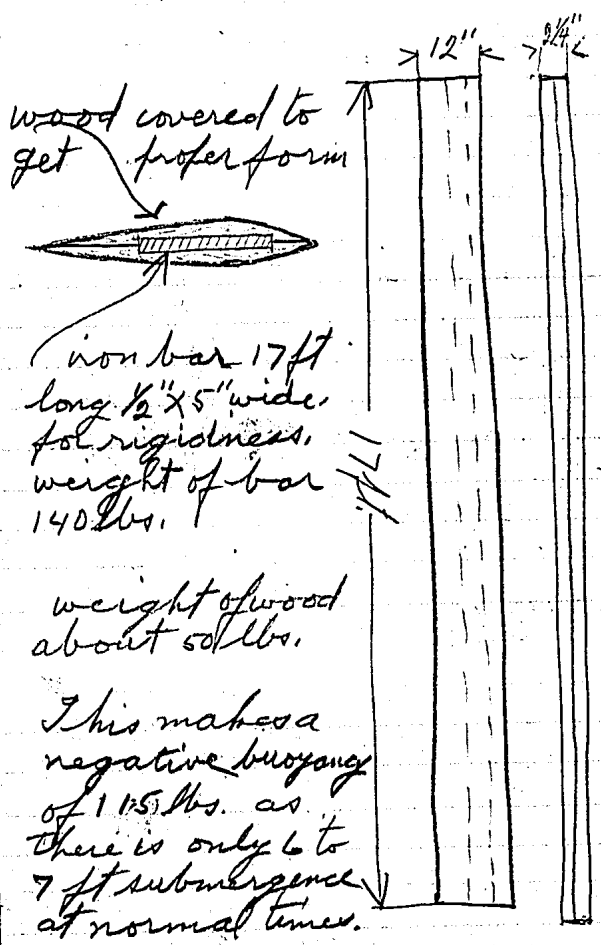
The clamps on the bow-sprit is only 3" wide. those are the ones I used before in other experiments.

They have not enough of bearing surface to ~~[illegible]~~ overcome the resistance of column.

I think by making those clamps about 6" wide there will be sufficient grip to hold it.

However this tendency to rise remains, when boat rools, and it seems as though this method is not very practical with such a long shaft.

Construction of dummy shaft.



Jan. 18.

We now come into to the navy yard. 10 30 A.M. I left for Lab. to report but missed my train. I will report Monday.

Jan. 20.

Reported results of last experiments to Mr. E.

I am having Bunnemake a model of a new scheme for suspending shaft.

We are now in search of another boat.

Jan. 22.

After looking at some boats We decided that Sample is the most suitable boat for our purpose.

Jan 23.

Am constructing various scale models of wood to learn if form has any effect on sliding.

Jan 25.

Have Burns making new suspensions.

Jan 27.

Myself and Burns went to Sachem this P.M. with models. Phoned for truck to take machinery from Sachem to Sab.

Jan 28.

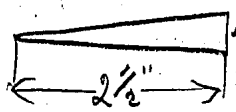
We got machinery and supplies in shape to move of boat.

Jan 29

truck arrived, We loaded same and transferred material to Hawk.

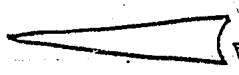
I went out in the small launch in the P.M. to try small models, had Burns along.

Nos. 1 2 3.



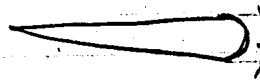
3 of these different thickness 1/4", 3/8", 1/2",

Nos. 3 4



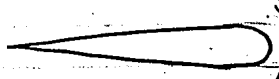
2 of these 1/4" and 3/8"

Nos. 5 6



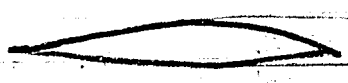
2 of these 1/4" 3/8"

Nos. 7 8 9



3 of these 1/4", 5/16", 3/8"

Nos. 10, 11,



2 of these 5/16" 3/8"

The above were all 34" long 2½" wide. The thickness were as shown.

Jan 29,

I tried all the different form models shown on the opposite page.

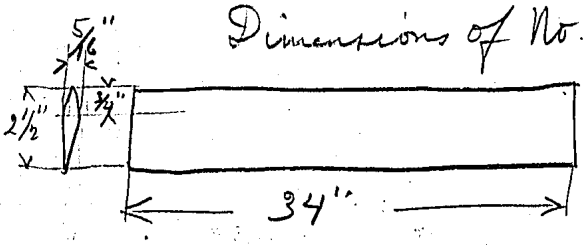
I find that the shape of the model has nothing to do with the riding qualities.

The resistance of all the forms were very great it being almost impossible to hold them with both hands.

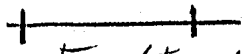
The best one, that is the one having the least resistance and creating the least disturbance was the No. 10.

This was very easy to hold with one hand.

Dimensions of No. 10.

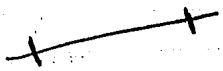


No 1.



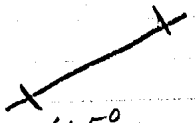
straight suspension

No 2.



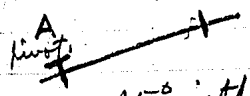
25° suspension.

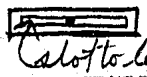
No 3,



45° suspension.

No 4.

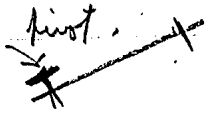




Slot to let stay swing

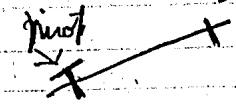
25° with pivot at A and a plate on the back as shown

No 5.



25° with slot curved down from center.

No 6.



25° with slot turned up.

I also tried the different suspensions shown.

I found that column would stay in water at 25° angle, as shown at No 2. but would go from side to side when rooling of boat is imitated.

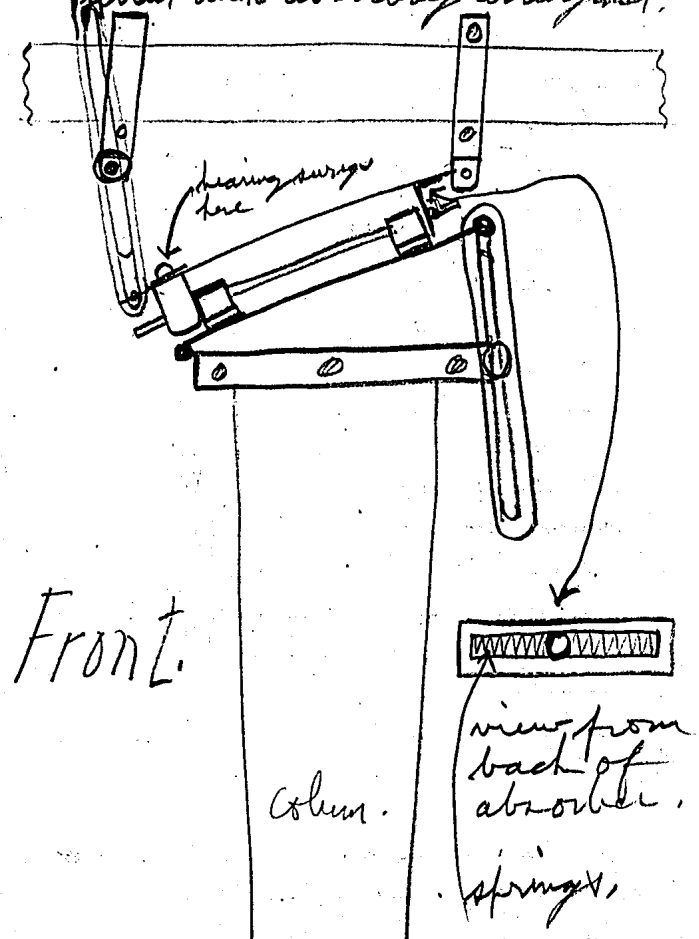
No 4 scheme works very good, the slot in the back bearing allows for this rooting, and lets the column remain straight.

This is a pretty good stunt.

No 3. is terrible. The strains can be plainly seen when rooling.

Now comes my
Am going to develop the No 4. scheme, It looks good.
Left Sachem for home 7 P.M.

Model made so as to get any angle
fitted with absorbing arrangement.



Jan 30.

Left Lab to go aboard Hanoli to instruct Captain as to work and alterations to be done.

Jan 31.

Am making a new suspension so that I can change the angle from a straight to 45° and get all the intermediate angles.

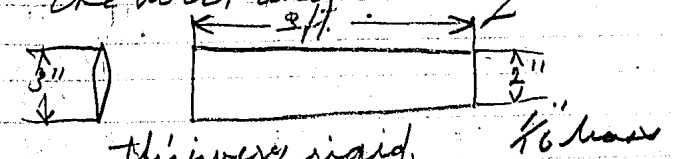
I want to find out the minimum angle that column will ride at.

Feb 4.

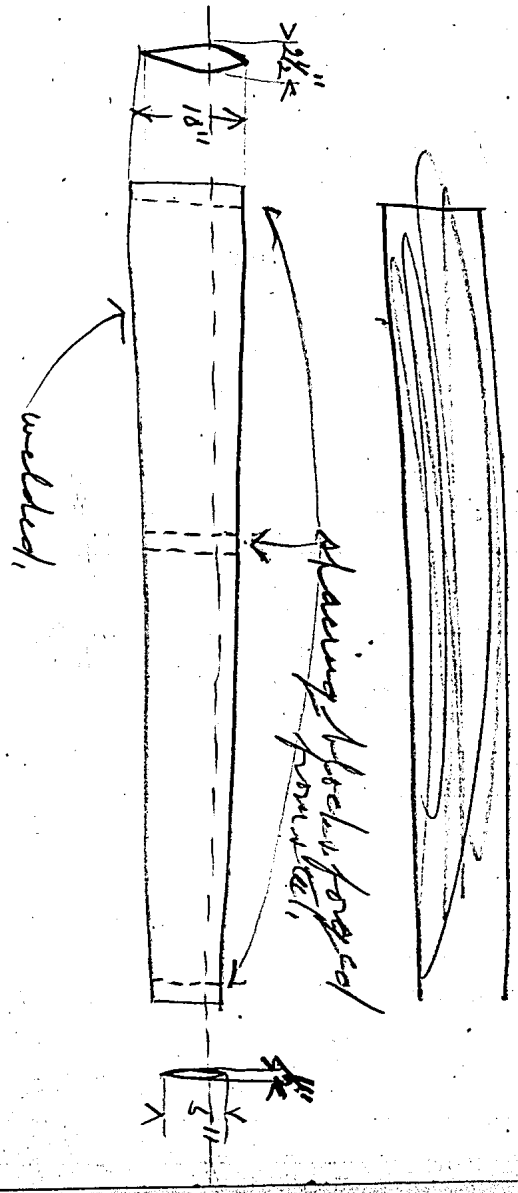
Have this ready to try on small launch as soon as it gets turned over to Hanoli.

Feb 5.

I made some scale models from sheet brass to demonstrate the twist and bending.



this is very rigid.



Feb. 6.

I moved from No 4 Bldg. to No 1. Bldg.

Am having room No 3 fitted up to carry on experimental work.

Feb. 8.

Am laying out a one half size column to use on small launch with new suspension. (on opposite page.

As will be noted this will taper both ways.

It is made of ½" machine steel, with three spacing blocks at equal distances. It is welded along front and back seams.

Feb. 10.

Went to Hauoli at Benson hurst to get my tools.

I also brought over 3 ft model and suspension.

Feb. 12.

Received word from Mr. Barry that launch was turned over.

Feb. 13.

Left for Benson hurst to try model out in small boat.

Captain Harris to be commander of Hauoli, and Capt. Jones ~~[illegible]~~ Cleans boat.

Feb 13.

I made the following tests in launch in the afternoon,

Test No 1,
I tried streamline colunchung in a horizontal position.
This would raise out of the water (I expected this)

No 2,
Tried at angle of 5°
Would still come to surface

No 3,
tried 10° angle.
The tendency is reduced noticeably.

No 4,
Tried 15° angle,
This is much better.
The absorbing arrangement works fine here when I imitate rooling by turning bowsprit.

No 5.

Tried angle of 20°

This is fine the column stays vertical no matter what I do with bow & fit (roll or pitch)

No 6.

tried 30° angle.

This seems not quite so good, it seems to be to much angle.

The 20° seems to be the point.

I tried again at 15° to see if I could reduce it any but 15° is not quite enough.

It acts sluggish.

20° is fine, I observed it working at this angle a long time.

The absorbing stuff is O.K.

This is quite an advantage to reduce from 45° to 20°

as it eliminates a lot of strain.

The shock absorbers take care of what little strain there is left.

All the above tests were made at a speed of 10 knots.

Model is much more steady when at a rake of 5° than when vertical.

There is a little vibration when vertical.

I now come in and go home.

I left pictures to show with Capt. Hahn to get framed in good shape as I will be ready to use it in a few days.

Feb. 14.

Burns has 8 ft column finished except smoothing of a little.

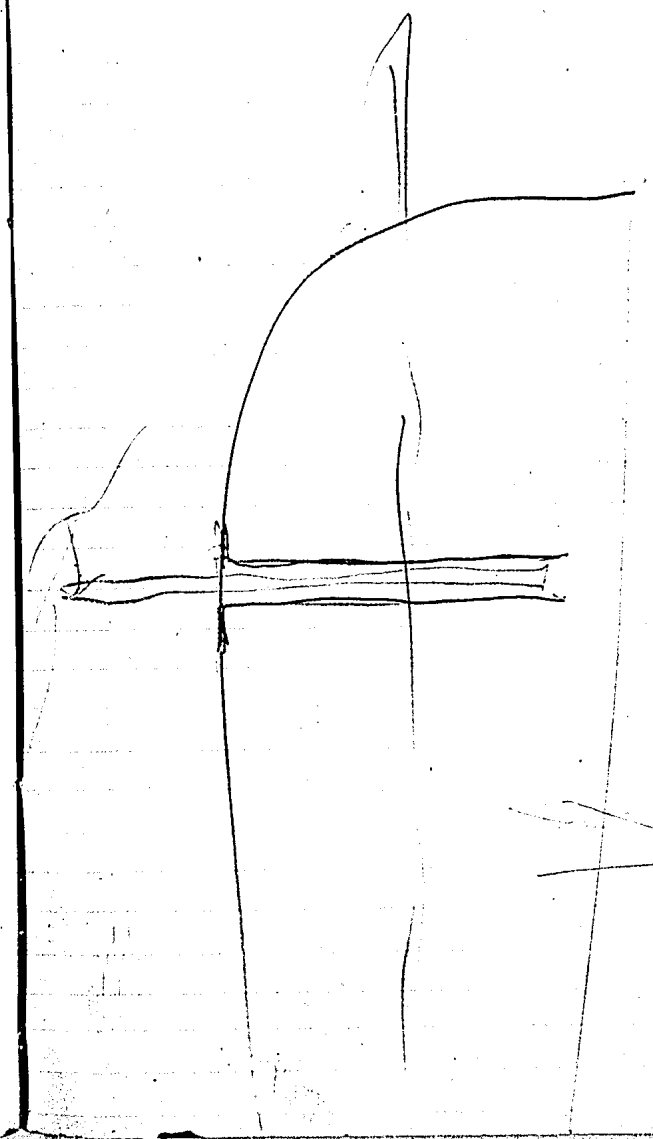
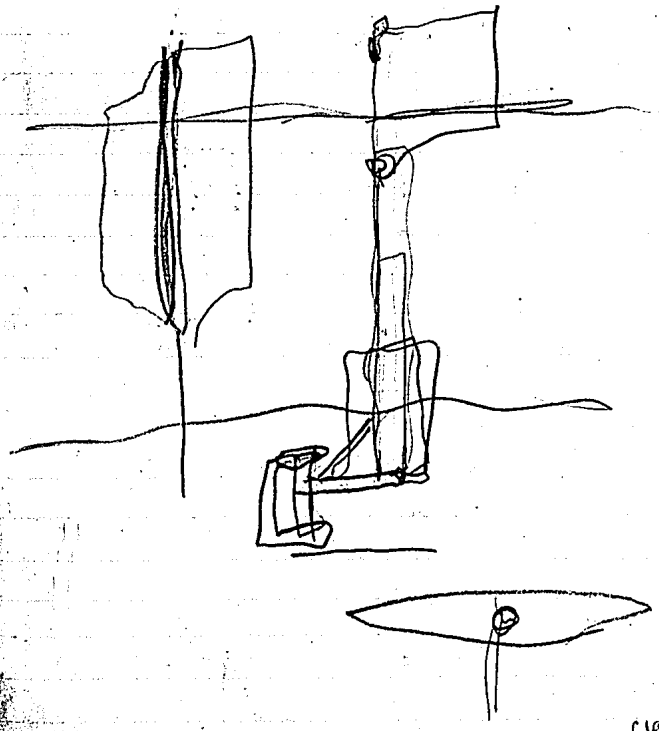
This is a very rigid affair does not twist or bend.

I tried to twist with a 2 ft. lever on bottom but could not notice any twist.

I am laying out an absorbing suspension to put on launch to try out for riding on same in a rough sea.

Continued in Book No 2.

Sub. detector experiment.



res of No 1 transmitter,
69 ohms before putting in water
~~res~~ of No 3 transmitter.
76 ohms before putting in water.
No. 2 180 ohms.